HAVSTOVAN
FAROE MARINE RESEARCH INSTITUTE

Current measurements on the Faroe Shelf 2010

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TECHNICAL REPORT

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Introduction

In the last few years, one of the major questions at the Faroe Marine Research Institute (FAMRI) has been what controls the primary production on the Faroe Shelf. The primary production has large inter annual variations, which are transmitted up through the food web and have considerable impact on, for instance, the mean weight of Faroe plateau cod and haddock. In a primary production model, the inter-annual variations are linked to the exchange of Faroe Shelf Water (FSW) (Eliasen et al, 2005) and, therefore, an increased effort is put into expanding our knowledge about the actual exchange of FSW. Besides a post doc work (in progress) on a high resolution model for the Faroe Plateau, the FASE (FAroe Shelf Exchange) project was initiated (2001) were the aim is to obtain temperature, salinity, and current measurements of exchange through the Faroe Shelf Front. In the FASE project, FAMRI has made some current measurements on the Shelf, the first one being a deployment of an Acoustic Doppler Current Profiler (ADCP) on the bottom at 150 meters depth close to a canyon on the western part of the shelf. The results from that deployment are described in Larsen et al (2009). In February 2010 the ADCP was redeployed also on the western part of the shelf, but now in an area, where particularly high phytoplankton abundance (chlorophyll *a*) have been observed. In addition to that, FAMRI's research vessel R/V Magnus Heinason in late April 2010 was on a special cruise (cruise 1012), with the main task to investigate the production and hydrography in this same area. On this cruise, three mooring rigs with traditional current meters and temperature recorders were deployed close

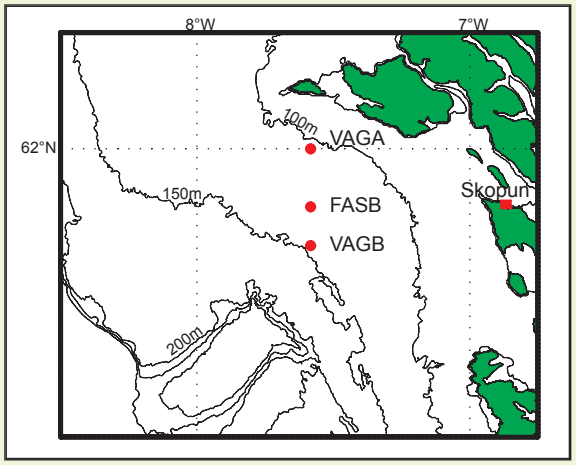

Figure 1. Map of the study area. The three deployment locations are indicated by large red dots and deployment id. Coastal station Skopun is indicated by a red square.

Table 1. List of deployments with information on duration and range of valid data. All depths are in meters.

Deployment	Bottom depth	Int. min.	Valid data period	Dur. days	No. bins	Depthrange	Instrument type
FASB1002	128	20	2010 02 20 - 2010 09 04	197	27	17 - 121	ADCP
-		5			-	127	Microcat
SKOP0811	18	5	2010 03 20 - 2010 10 11	206	-	4	Microcat
FASB1004	128	5	2010 04 21 - 2010 04 23	2	-	48 - 98	2xAanderaa
-		1			-	73 - 117	2xStarmon
VAGA1004	106	5	2010 04 23 - 2010 04 26	3	-	26 - 76	2xAanderaa
-		1			-	95	Starmon
VAGB1004	143	5	2010 04 21 - 2010 04 26	5	-	23 - 73	2xAanderaa
-		1			-	48 - 137	2xStarmon

to the ADCP mooring, one of them with the aim to calibrate the ADCP compass.

This report documents the data from the ADCP mooring and the three current mooring rigs from cruise 1012. Up to four instruments were on each mooring and these details are listed in Table 1. In addition, data from the mooring of a SeaBird MicroCat at the coastal station Skopun are also documented. All deployments are identified by an 8-character label where the first four characters indicate the site while the last characters show year and month of deployment. Figure 1 shows the location of the deployments.

Quality control and calibration

The ADCP data at FASB1002 have been quality controlled by a standard procedure based upon consideration of ADCP performance (error velocity etc.) and data variation with time in relation to neighbouring bins (spikes). The editing has been done manually using an interactive graphical software package developed by the FAMRI, based upon MATLAB. Similar software packages are developed for the Aanderaa, MicroCat and Starmon data. The editing has been done with a philosophy of minimal interference. Thus, only observations which were considered clearly erroneous were flagged. For the ADCP data usually, such series are edited up to the level where about 50% of the observations are found to be valid, but here one additional bin is included, although it was heavily influenced by noise during some periods. The last bin included must, therefore, be treated with this in mind. The velocity direction has been corrected for magnetic deviation and compass offset, by adding a constant as indicated in the header of the data file (p. 17). The value of the constant was found from the deployment of a calibration rig, FASB1004. FASB1004 was equipped with two traditional Aanderaa current meters (for more detail see p. 26) and simultaneous measurements of current direction at two depth layers from the ADCP and the two Aanderaa current meters are shown in Figure 2 a) and b) for uncorrected and corrected ADCP direction, respectively. The instrument depth at site FASB1002 is found from the Microcat pressure measurement, which corresponds to the echo soundings of the ship.

The Aanderaa data have been calibrated using calibration coefficients from the manufacturer, if available. Temperatures for all instruments have been recalibrated against CTD profiles close to the moorings locations, resulting in a constant offset that is added to the data. Three of four instruments had pressure sensors, but the surface readings of these sensors indicated, that the calibration coefficients were wrong. Since the pressure values are a linear function of the sensor readings ($P = a \cdot D + b$, were P is pressure and D is the digital reading) new coefficients (*a* and *b*) were calculated based on the surface and deployment readings and expected deployment depth. Pressure values are therefore not exact, but pressure variations are reasonable. In the Aanderaa current meter, several speed and compass readings are taken during a sampling interval, while the temperature and conductivity readings are taken once at the end of the interval only. At the end of the interval, the instrument stores a vector average of the velocity for the whole sampling interval, as well as the temperature and conductivity readings. In the data file, the time of each record is the middle of the speed-averaging interval. In the calibration procedure the velocity direction has been corrected for magnetic deviation, by adding a constant. The actual correction for each deployment is stored in the header of the data file. The data have been quality controlled by a standard procedure similar to the ADCP data.

Data from the Microcat instruments have also been quality controlled by the standard procedure mentioned above. Data were calibrated using the new instrument (May 2008) calibration coefficients from the factory. The FASB1002 MicroCat (SN 6094) was calibrated against CTD after its first deployment (FASA0811) and this calibration confirmed the original calibration constants. A recalibration against CTD was made after the FASB1002 deployment and now the MicroCat had an offset of 0.006°C in temperature and 0.06 in salinity, which is rather high for the salinity. On the other hand, the salinity measurements at FASB1002 had a decreasing trend through the whole deployment period (magnitude 0.8 / 6.5 months) and also a few large jumps probably caused by accumulation of sand in the conductivity probe. These data are, therefore, left uncorrected and must be interpreted with caution. The MicroCat at SKOP1003 (SN 4568) has been post-deployment calibrated against the MicroCat from FASB1002 and had a temperature

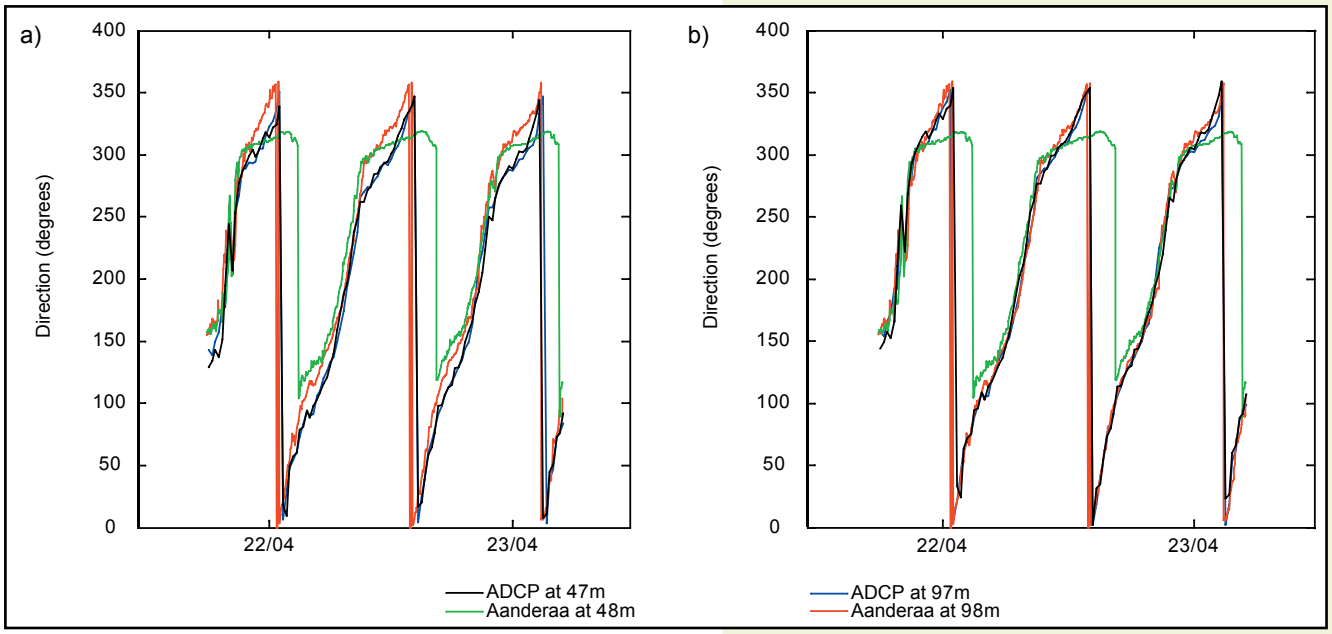

Figure 2. Velocity direction at two levels from the ADCP at FASB1002 and from the two Aanderaa current meters on FASB1004. The Aanderaa direction is corrected for magnetic declination while the ADCP data in a) are uncorrected and in b) are added a constant (+15°), which is the average difference in direction between an ADCP layer at 97m and Aanderaa at 98m. Notice the improved match between the black, red and blue lines in b) compared to a) as you follow the increase in direction from 0° to 360°. The Aanderaa instrument at 48m had lost its rotor and also one of the tail fins was broken and this explains the bad match between the green line and the other lines.

offset of the same order as the FASB1002 MicroCat. The salinity measurements from SKOP1003 failed.

The temperature data from the Starmon instruments have been quality controlled in a similar manner as the other data. As the temperatures from the Aanderaa instruments the Starmon data have been calibrated against CTD profiles close to the mooring locations, and the readings of all the Starmon instruments were found to be within their specified accuracies.

Report format

This report contains a section with some preliminary results from the data and comparison of contemporary measurements. Then, there are a number of pages for each deployment where the first page has a drawing of the mooring and details of the deployment. After that, there are some pages describing the data from the individual instruments on the mooring.

The ADCP data (FASB1002 only) begin with a page with detailed error statistics for the deployment, which indicates also how many “long” (i.e. several consecutive ensembles) error gaps are for each bin. On the next page, there is for each bin listed the average speed (scalar average) and velocity magnitude and direction (vectorial average) as well as the fraction of “good” ensembles (in parts per thousand). This is followed by a frequency distribution of speeds for each bin, which lists

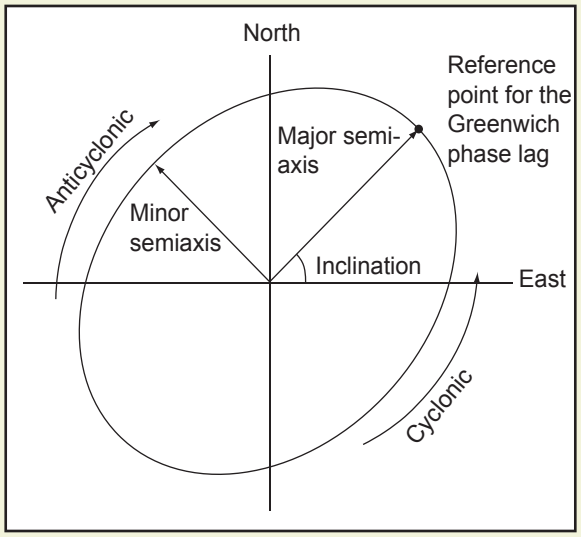

Figure 3. Parameters of the tidal ellipse for a given constituent. The reference point for the Greenwich phase lag is always chosen to be above the east-west axis.

the frequency (in parts per thousand) of speeds (scalar) exceeding specified values. Then there are some pages listing tidal constituents. These pages contain five tables with data for the constituents M2, S2, N2, O1, and K1. Each table lists for each bin the amplitude and Greenwich phase lag for the east and north velocity components and lists also major and minor semi-axes of the tidal ellipse for the constituent as well as its inclination (Fig. 3), Greenwich phase lag and sense of rotation (cyclonic = C, anticyclonic = A). The tidal constants were computed by an adapted version of the Foreman FORTRAN package.

The description of the Aanderaa current meter data includes first a text page (only for Aanderaa data with valid current measurements) listing metadata information in the header and showing the list of parameters in the data file with a tally of the number of records flagged and not flagged for error in each parameter. Any comments to the data are then listed. The rest of the text page describes features of the velocity observations in the series. First is shown the residual current, defined as the vectorial average of all non-flagged records. Next are shown the results of tidal analysis on the series. The number of records interpolated before the analysis is listed as well as the number that could not be interpolated (too large gap), followed by the filters used before the tidal analysis is performed. Five dominant constituents are listed and for each constituent, amplitude and Greenwich phase lag are shown for the east (E-ampl and E-gpl) and the north (N-ampl and N-gpl) velocity components respectively, followed by the characteristics of the tidal ellipse, its major and minor semi-axes, the inclination (Incl) of the ellipse, its Greenwich phase lag (Grphl), and whether it rotates cyclonically (C) or anticyclonically (A). The definitions of the tidal ellipse parameters are shown in Figure 3. The tidal constants were computed by an adapted version of the Foreman FORTRAN package. Finally, on the Aanderaa text page, is a table listing the directional current distribution as relative numbers of observations in parts per thousand. The table also lists for each direction interval, the relative flux, the average speed and the maximum speed. Then one or two pages show plots of the listed parameters as a function of time and one page shows the progressive vector diagram.

For each of the three Aanderaa deployments, temperatures from all four instruments are plotted together on the last page for the deployment.

The Microcat data from the FASB1002 deployment are presented on two pages, the first page showing plots of temperature, salinity and depth time series, while the second is a T-S diagram of the recorded data. The salinity measurements from SKOP1003 failed and therefore only temperature is shown (the instrument does not have a pressure sensor).

Preliminary results

In this section, a few preliminary results are presented where data from the three moorings are compared to each other and also to data from coastal station Skopun.

Temperatures and primary production

For a period of 5½ months, the data at FASB1002 and SKOP1003 overlap and in Figure 4 the temperatures from the MicroCats for their whole periods are plotted. As at FASA (Larsen et al, 2009), near-bottom temperatures at FASB are higher than on the central shelf during winter and lower during summer. FASB, though, has a few events during spring, where temperatures are similar to the temperatures at Skopun. In this first period, temperatures at FASB also are quite variable, indicating the proximity of the Faroe Shelf Front. Both locations have a winter minimum on the 26. February, and during April and May they have local minima and maxima, but the variations are not in phase, making it difficult to come to any conclusions regarding the interaction between FASB and the central shelf. On the other hand, an obvious front event is initiated at FASB on 27. March as the temperature suddenly increases by more than one degree (indicated by the black arrow in Figure 4) followed by daily temperature variations on the order of half a degree. This event seems to be advected to the central shelf within a day or two, but here merely as a temperature spike with an increase around 0.2 degrees (indicated by the blue arrow in Figure 4).

Also plotted in Figure 4 is the weekly chlorophyll-*a* concentration at coastal station Skopun. The chlorophyll-*a* levels were relatively high already when the measurements were initiated in spring 2010. The spring bloom started in mid-April and reached a maximum late in May, but it had two local minima during May. Figure 5 is a blow up of Figure 4, but limited to this period with the local

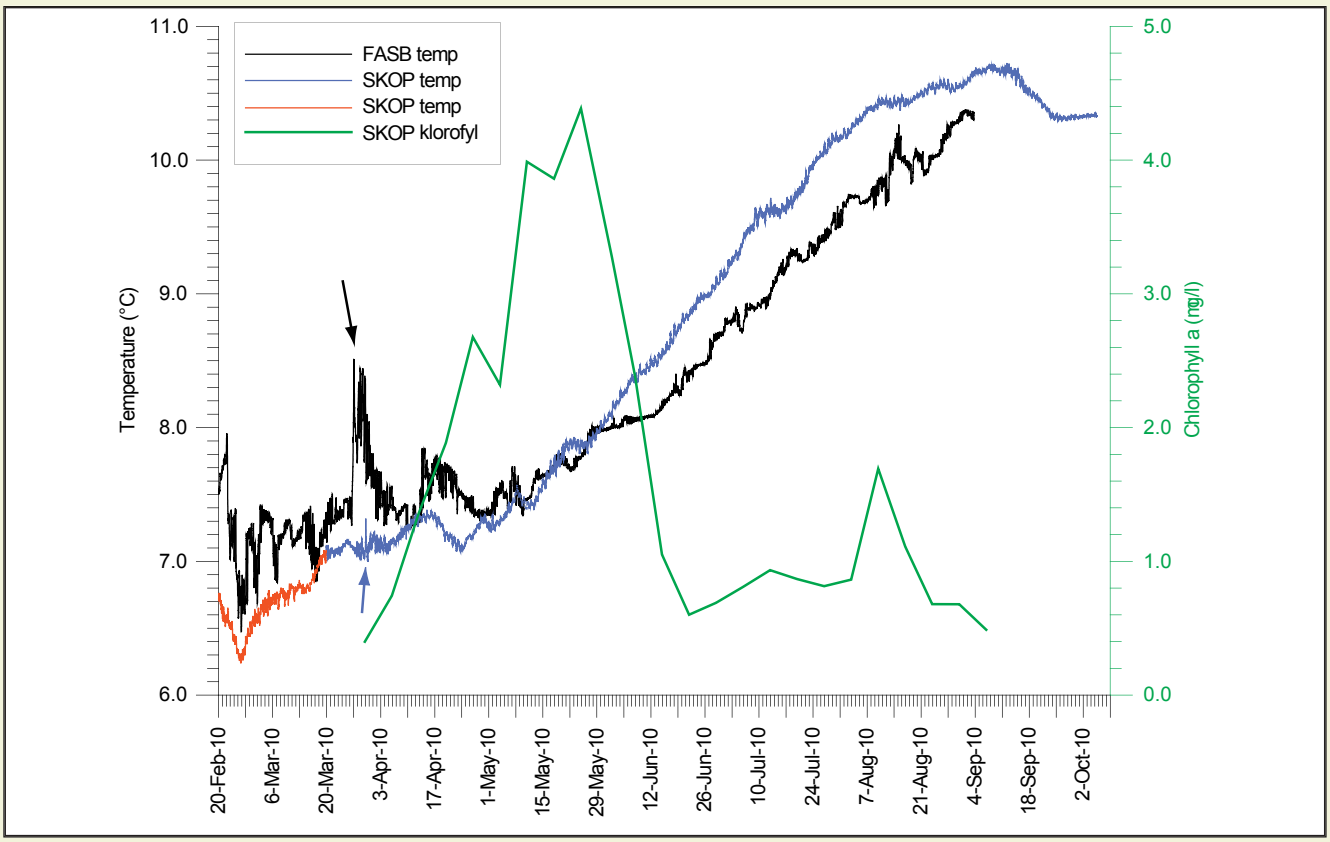

Figure 4. Temperature at the MicroCat (sea floor) at FASB1002 (black) and at the MicroCat at SKOP1003 (blue). The latter series has been extended with temperatures from a Starmon sensor at Skopun (red). Also shown is the Chlorophyll a (green) at coastal station Skopun. The arrows indicate the front event referred to in the text.

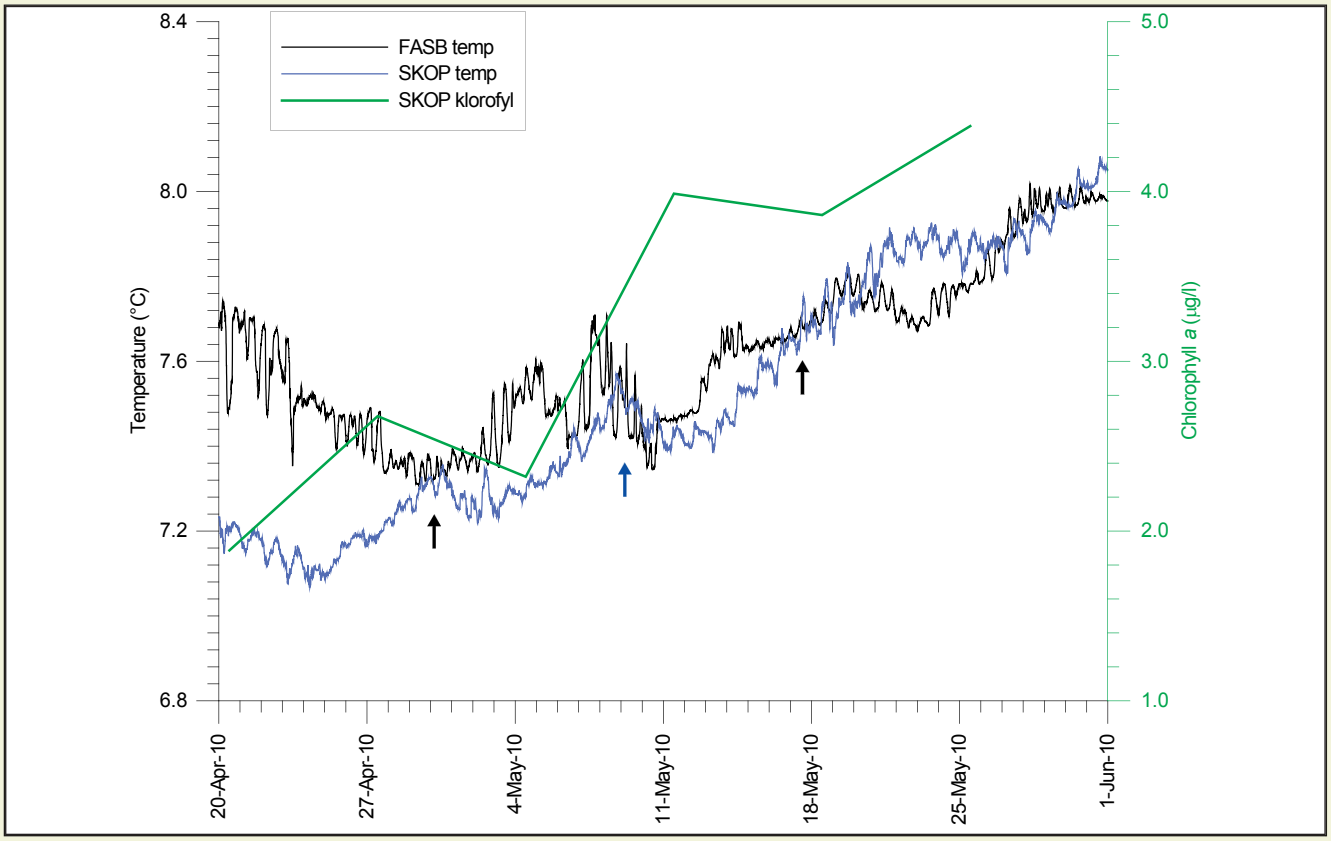

Figure 5. Same as Figure 4, but now for the period 20. April – 1. June. Black arrows indicate two periods, where the temperatures at FASB and SKOP are very similar, while the blue arrow indicates a period where FASB becomes colder than SKOP.

minima. Here it can be seen, that the minima occur after or while the temperatures at FASB and SKOP are approximately the same, thus supporting the hypothesis that a change in the central shelf circulation from a narrow circulation cell to a wider cell might decrease (or dilute) the chlorophyll concentration on the inner shelf (Hansen et al, 2010). If this is correct, water from the inner shelf extends at least southwestwards to FASB. This also seems to have occurred in the first half of April (Figure 4), but here no decrease is observed in the chlorophyll concentrations. Finally, around 9 May (blue arrow in Figure 5), the temperatures at FASB again were fluctuating around the temperature values at SKOP, but during this period the temperatures at FASB became lower than at SKOP, indicating that this is not inner shelf water that is advected towards FASB. This cooling at FASB can either be local atmospheric cooling or advection of an off-shelf water mass or a combination of both – temperatures at both FASB and SKOP are decreasing during this period, but we would expect SKOP to decrease more if it only is local cooling (anticipating the same magnitude of cooling at both locations).

Intensity and primary production

The function of an ADCP current meter as at FASB1002 is to send a sound signal into the water column and listen to the echo or backscatter from particles in the water. The intensity of the backscatter then is a measure of the concentration and/or composition of particles in the water column. The relation between intensity and particles is not straight forward though, but assuming other things being equal, then the larger the intensity the larger the concentration of particles. The ADCP, though, does not give any information on what kind of particles are in the water column.

In Figure 6 are plotted the backscatter intensity from the ADCP at FASB1002 and the chlorophyll concentration at Skopun. The Figure indicates that increased growth near Skopun is observed as increased concentration of backscatter throughout the water column at station FASB1002, after a four days time-lag. As mentioned above, the backscatter variation can arise from different changes. At FASB the backscatter can represent many different biological or physical parameters. The apparent co-variability holds promise for an increased understanding of the physical/biological processes underlying the Faroe shelf primary production.

Progressive Vector Diagrams

Simultaneous Progressive Vector Diagrams (PVD) from the current meters at the three locations VAGA, FASB and VAGB are shown in Figure 7. The current meters are all on the same longitude, where VAGA and VAGB are 6 nm north and 4 nm south of FASB, respectively. Despite the rather regular and gentle bottom slope, the PVDs from the three locations are quite different. Not surprisingly, the PVD at the near-shore VAGA has the largest residual velocity. Tidal currents here are almost twice as large as at the two other locations and these tides produce residual currents by tidal rectification (Larsen et al, 2008). At VAGA the residual currents are more than twice the residual currents at FASB and VAGB. The tidal currents at FASB and VAGB are similar in magnitude, but the residual at FASB is somewhat less than at VAGB, indicating that FASB is close to the center of a retention area. This is also verified by preliminary model results (Personal communication, Till Rasmussen, DMI). The PVDs in Figure 7 for VAGB indicate a much more shoreward residual than at VAGA and FASB. But this is not necessarily true for a long term residual velocity as indicated in the PVD for the first deployment days (p. 48), which have a more along shelf residual.

Also vertically, the PVD's can be quite different. At FASB the ADCP data show that the winter months show large vertical differences (Figure 8.a), while the summer months have much more regular PVD's (Figure 8.b). During winter this might be associated with the frontal movement across the ADCP and Figure 9 shows the PVD's at three depths as the temperature at the location increases by more than 1°C on the 27. March (Figure 4). It is seen in the PVD's for the lower layers that a shoreward movement is initiated during 27. March and continues during 28 and partly 29 March, which is in agreement with warmer waters reaching FASB as the front moves on-shelf. The first temperature increase is around noon on the 27 March. The upper layers, although largely error flagged during the 27 March, tend to have a more off-shelf direction.

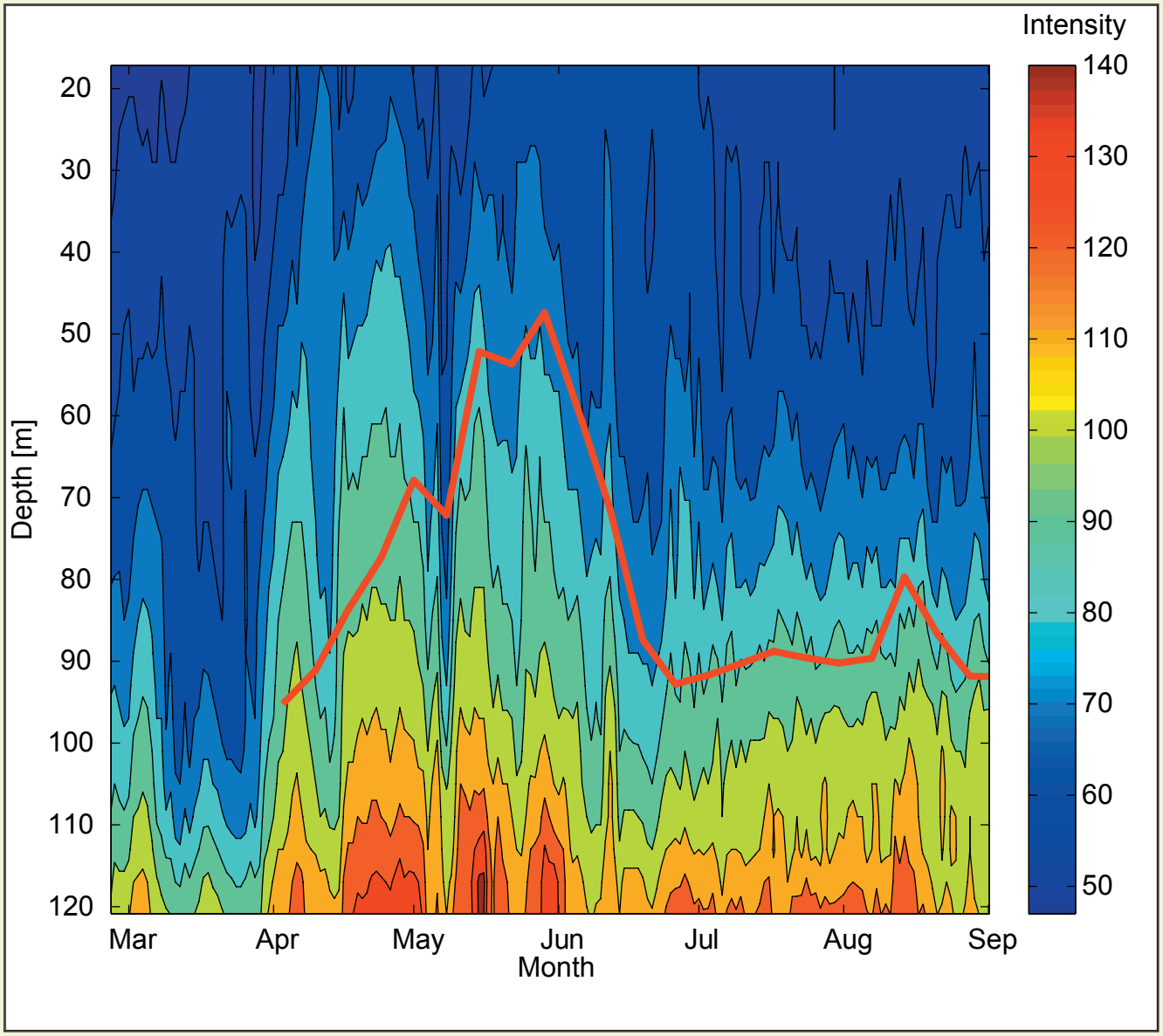

Figure 6. Backscatter intensity (colors) from a bottom mounted ADCP at station FASB1002, and the chlorophyll concentration at coastal station 'Skopun' (red), not to scale and shifted four days forward in time. This indicates that increased growth near Skopun is observed as increased concentration of backscatter throughout the water column at station FASB1002, after a four days time-lag.

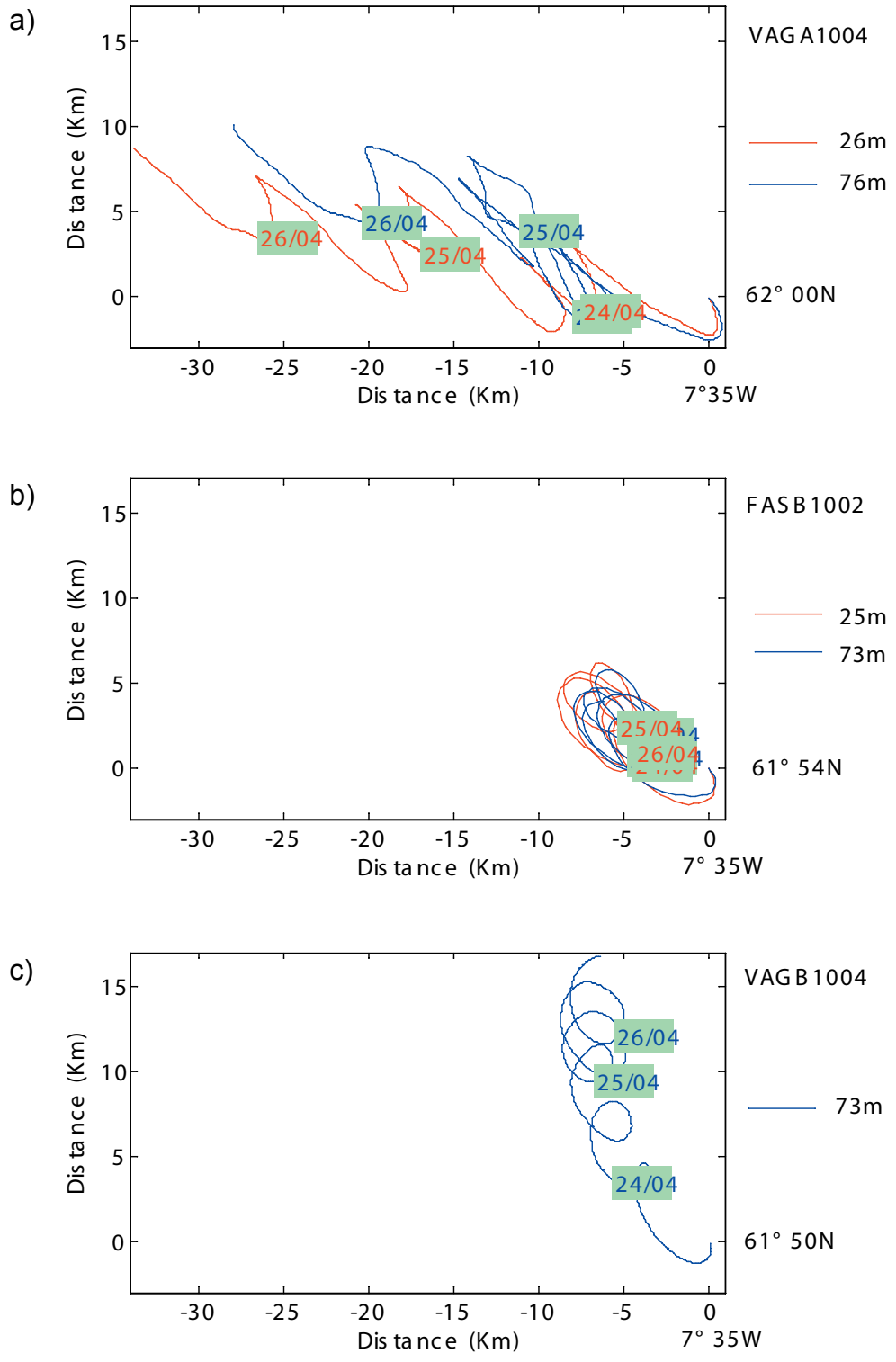

Figure 7. Progressive Vector Diagrams from the current meters at VAGA (a), two selected layers at FASB (b) and from the lower current meter at VAGB (c) in the period 23 – 26. April 2010. Dates (midnight) are indicated on each PVD.

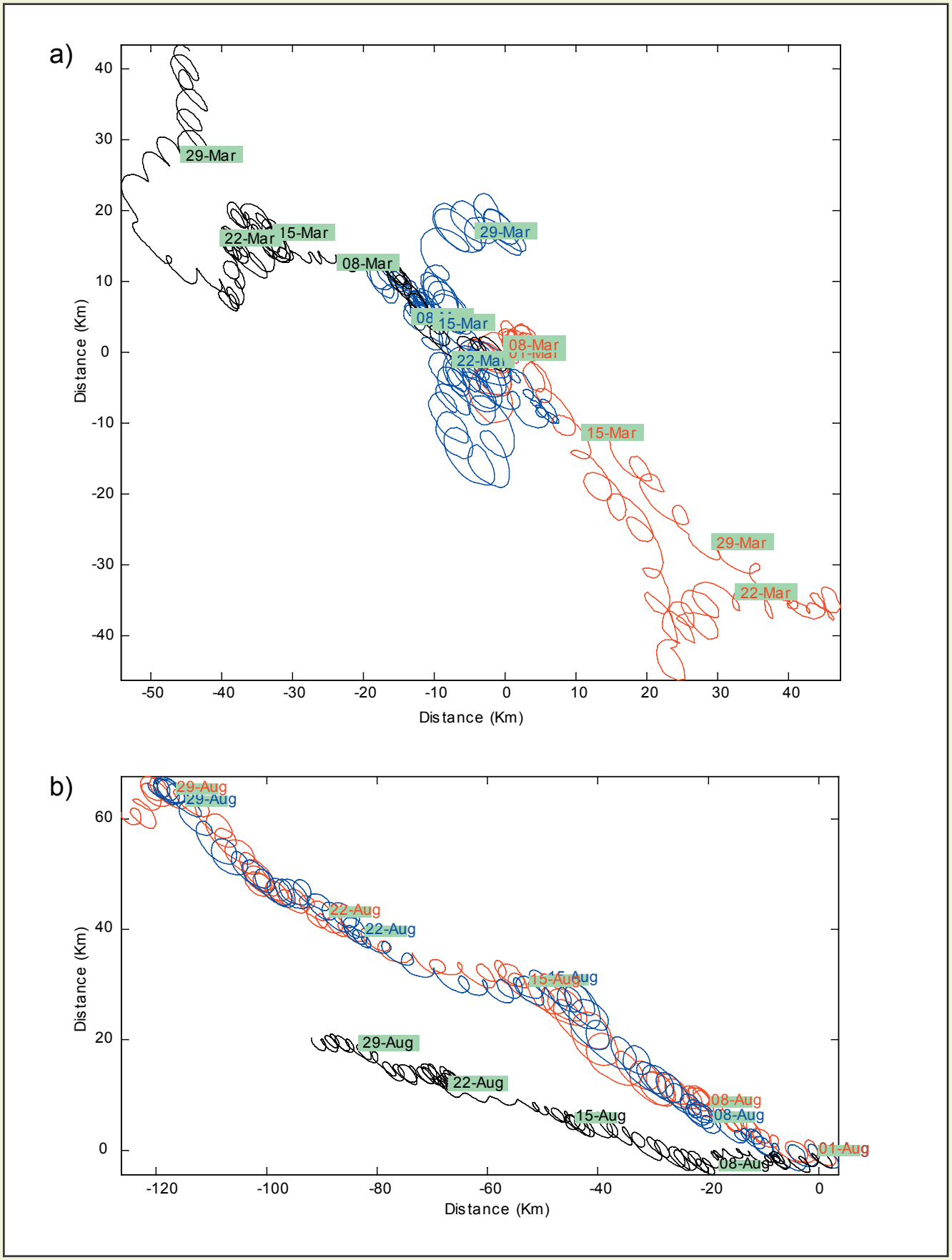

Figure 8. PVD's at FASB during March (a) and August (b) at bin 1 (121 m depth - black line), bin 19 (49 m depth – blue line) and bin 25 (25 m depth – red line).

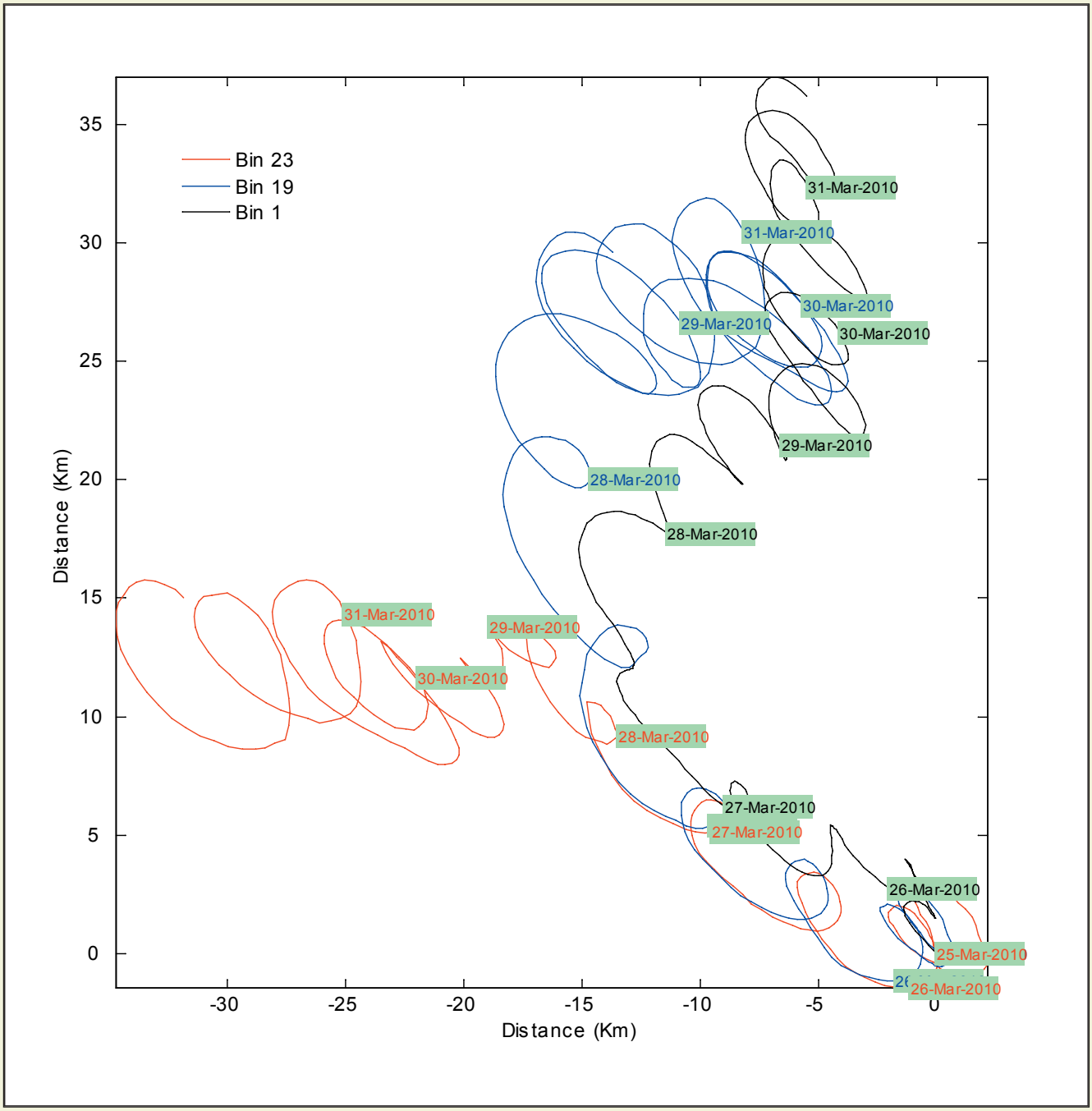

Figure 9. PVD's at FASB from 25 to 31 March (both days included) at bin 1 (121 m depth - black line), bin 19 (49 m depth – blue line) and bin 23 (33 m depth – red line).

Refererences

Eliasen, S. K., Gaard, E., Hansen, B. and Larsen, K. M. H. 2005. A »horizontal Sverdrup mechanism« may control the spring bloom around small oceanic islands and over banks. Journal of Marine Systems, 56: 352-362.

Hansen, B., Gaard, E., Debes, H, and Larsen, K. M. H. 2010. Abrupt interruptions in the spring bloom on the Faroe Shelf. Dorete - her book, Annales Societatis Scientarium Færoensis Suplementum, 52: 21-35. Faroe University Press, Tórshavn, 307 pp.

Larsen, K. M. H., Hansen, B., and Svendsen, H., 2008. Faroe Shelf Water. Continental Shelf Research 28 (14): 1754-1768.

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FASB1002 data

Latitude: 61° 53.950´N

Longitude: 07° 34.860´W

Echo sound depth: 125 m

Bottom depth corr.: 128 m

Time of deployment: 20/2-2010 1514 UTC

Time of recovery: 4/9 - 2010 0820 UTC

ADCP:

Instrument no.: RDI WH Sentinel ADCP 0936

Instrument frequency: 300 kHz

Height above bottom: 1m

Depth: 127 m (corr.)

Time of first data: 20/2 – 2010 1540 UTC

Time of last data: 4/9 – 2010 0740 UTC

Sample interval: 20 min

No. of ensembles: 14089

Pings per ens.: 50

Binlength: 4 m

Depth of first bin: 121 m (corr.)

No. of bins: 36

Micro Cat:

Instrument no.: 6094

Height above bottom: 1 m

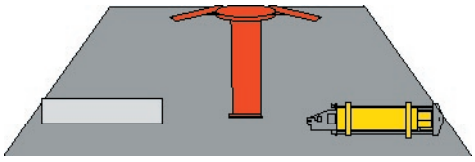
Time of first data: 20/2 - 2010 1520 UTC

Time of last data: 4/9 - 2010 0820 UTC

Sample interval: 5 min

No. of ensembles: 56365

Instrument depth: 127 mData:



Data:

Ok, except for the MicroCat salinity data that both have a decreasing trend and large jumps

FASB1002 ADCP 0936

Error statistics for deployment: FASB1002 updated 2010/09/29

Surface distance not available
Heading, pitch and roll not edited
Temperature edited by KMHL in Sep 2010
Velocity edited up to and including bin 27 by KMHL in Sep 2010
Intensity edited up to and including bin 27 by KMHL in Sep 2010

Total number of ensembles: 14089
Interval between ensembles: 20 min
Original number of bins: 36
Number of acceptable velocity bins: 27
Number of acceptable intensity bins: 27

Flagged values have been replaced by error codes: -999.99 for temperature, -999 for velocity and intensity. For observations where velocity is flagged, error codes have been inserted into speed, direction and vertical velocity files

Number of temperature ens. flagged: 0

Below are for each bin listed ensembles flagged for intensity in number and for velocity in number and % of total ens.number. For velocity is also shown the number of gaps of various lengths (gap length = number of consecutive flagged ens.)

Bin	Int. ens. flgd	Velocity ens. flgd	% flgd	Number of velocity gaps of length									
				1	2	3	4	5	6-10	11-20	21-30	31-50	>50
1	0	10	0	8	1	0	0	0	0	0	0	0	0
2	0	9	0	9	0	0	0	0	0	0	0	0	0
3	0	16	0	16	0	0	0	0	0	0	0	0	0
4	0	18	0	18	0	0	0	0	0	0	0	0	0
5	0	10	0	10	0	0	0	0	0	0	0	0	0
6	0	20	0	20	0	0	0	0	0	0	0	0	0
7	0	13	0	13	0	0	0	0	0	0	0	0	0
8	0	16	0	16	0	0	0	0	0	0	0	0	0
9	0	12	0	12	0	0	0	0	0	0	0	0	0
10	0	16	0	10	1	0	1	0	0	0	0	0	0
11	0	21	0	15	1	0	1	0	0	0	0	0	0
12	0	32	0	26	1	0	1	0	0	0	0	0	0
13	0	63	0	45	7	0	1	0	0	0	0	0	0
14	0	64	0	33	11	0	1	1	0	0	0	0	0
15	0	96	1	49	17	1	0	2	0	0	0	0	0
16	0	141	1	67	21	2	3	0	2	0	0	0	0
17	0	156	1	55	24	7	1	0	1	0	1	0	0
18	0	228	2	89	24	12	5	0	2	0	1	0	0
19	0	307	2	102	28	12	6	1	4	2	0	1	0
20	0	429	3	135	29	17	6	5	7	3	0	1	0
21	0	589	4	137	49	14	6	3	8	3	0	2	1
22	0	776	6	131	49	23	11	3	7	1	0	2	3
23	0	1065	8	211	47	23	13	5	12	6	0	3	3
24	0	1474	10	222	64	27	14	10	11	3	2	2	7
25	0	1929	14	258	63	36	17	9	25	5	2	2	7
26	0	3943	28	569	181	64	42	18	35	14	5	2	13
27	0	11654	83	177	54	31	9	7	23	70	37	3	22

FASB1002 ADCP 0936

Deployment: FASB1002 updated 2010/09/29
Instrument no.: 936
Instrument freq.: 300
Latitude: 61 53.950 N
Longitude:07 34.860 W
Bottom depth: 128
Instrument depth: 127
Center depth of first bin: 121
Bin length: 4
Number of bins: 27
Number of first ensemble: 291
Time of first ensemble: 2010 02 20 15 40
Number of last ensemble: 14379
Time of last ensemble: 2010 09 04 07 40
Time between ensembles (min.): 20
All directions have been corrected by adding: 15.0

Below is listed for each bin the average speed (scalar average) and the average velocity magnitude and direction formed as a vectorial average of non-flagged (Good) observations. The last column shows the number of good values used in parts per thousand

Bin no.	Depth m	Height m	Speed mm/s	Vel mm/s	Dir deg	Good ppt
1	121	7	185	27	293	999
2	117	11	201	29	295	999
3	113	15	212	30	296	999
4	109	19	222	31	297	999
5	105	23	231	31	299	999
6	101	27	241	31	299	999
7	97	31	251	31	301	999
8	93	35	258	31	301	999
9	89	39	265	30	302	999
10	85	43	270	30	302	999
11	81	47	276	30	302	999
12	77	51	281	30	302	998
13	73	55	285	29	302	996
14	69	59	289	29	302	995
15	65	63	293	29	302	993
16	61	67	297	29	301	990
17	57	71	300	28	300	989
18	53	75	305	28	300	984
19	49	79	308	28	299	978
20	45	83	311	28	299	970
21	41	87	313	27	298	958
22	37	91	316	26	297	945
23	33	95	318	26	296	924
24	29	99	320	27	298	895
25	25	103	321	26	298	863
26	21	107	321	31	291	720
27	17	111	301	165	332	173

FASB1002 ADCP 0936

Deployment: FASB1002

Frequency of high speeds.
==========

Frequency (in parts per thousand) of speeds equal to or exceeding specified vales.

Bin no.	Depth m	Speed (cm/s) 10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
1	121	864	405	81	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	117	889	479	135	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	113	906	520	175	24	1	0	0	0	0	0	0	0	0	0	0	0	0	0
4	109	918	556	210	35	2	0	0	0	0	0	0	0	0	0	0	0	0	0
5	105	935	586	239	52	4	0	0	0	0	0	0	0	0	0	0	0	0	0
6	101	947	620	266	65	7	0	0	0	0	0	0	0	0	0	0	0	0	0
7	97	959	658	302	87	11	0	0	0	0	0	0	0	0	0	0	0	0	0
8	93	965	681	322	100	16	0	0	0	0	0	0	0	0	0	0	0	0	0
9	89	970	705	343	111	21	1	0	0	0	0	0	0	0	0	0	0	0	0
10	85	973	726	361	122	25	1	0	0	0	0	0	0	0	0	0	0	0	0
11	81	976	744	377	133	30	2	0	0	0	0	0	0	0	0	0	0	0	0
12	77	978	757	391	142	33	3	0	0	0	0	0	0	0	0	0	0	0	0
13	73	978	770	409	151	38	4	0	0	0	0	0	0	0	0	0	0	0	0
14	69	978	778	425	160	41	4	0	0	0	0	0	0	0	0	0	0	0	0
15	65	976	784	436	168	45	5	0	0	0	0	0	0	0	0	0	0	0	0
16	61	973	789	450	179	49	6	0	0	0	0	0	0	0	0	0	0	0	0
17	57	973	795	462	187	52	8	0	0	0	0	0	0	0	0	0	0	0	0
18	53	967	801	475	199	57	9	0	0	0	0	0	0	0	0	0	0	0	0
19	49	962	802	483	206	60	10	0	0	0	0	0	0	0	0	0	0	0	0
20	45	954	801	487	210	64	12	0	0	0	0	0	0	0	0	0	0	0	0
21	41	943	796	493	215	66	13	1	0	0	0	0	0	0	0	0	0	0	0
22	37	930	788	492	219	69	13	1	0	0	0	0	0	0	0	0	0	0	0
23	33	910	773	488	221	70	15	1	0	0	0	0	0	0	0	0	0	0	0
24	29	882	752	477	220	70	15	2	0	0	0	0	0	0	0	0	0	0	0
25	25	851	725	463	214	68	15	3	0	0	0	0	0	0	0	0	0	0	0
26	21	708	601	383	181	60	15	3	0	0	0	0	0	0	0	0	0	0	0
27	17	168	137	83	33	10	2	0	0	0	0	0	0	0	0	0	0	0	0

FASB1002 ADCP 0936

Harmonic constants for constituent M2 for deployment FASB1002.

Bin	Depth m	E-ampl mm/sec	E-gpl deg	N-ampl mm/sec	N-gpl deg	Major mm/sec	Minor mm/sec	Incl deg	Grphl deg	R
01	121	168	301	184	165	232	91	132	145	A
02	117	183	301	202	165	253	102	131	146	A
03	113	193	301	215	166	267	110	131	147	A
04	109	201	301	226	167	278	118	130	147	A
05	105	209	300	236	168	289	127	130	148	A
06	101	216	300	247	169	299	136	129	149	A
07	97	227	300	259	171	312	145	129	150	A
08	93	233	300	265	172	319	152	129	151	A
09	89	239	300	271	173	325	158	129	151	A
10	85	245	301	276	174	331	165	129	152	A
11	81	251	301	281	175	336	170	130	152	A
12	77	256	301	284	176	340	176	130	153	A
13	73	262	301	287	177	344	181	130	153	A
14	69	267	302	290	178	348	185	131	154	A
15	65	272	302	292	179	351	189	131	154	A
16	61	276	303	295	181	354	194	131	155	A
17	57	280	304	297	182	357	198	132	155	A
18	53	285	304	299	183	361	201	132	156	A
19	49	289	305	301	184	364	204	133	157	A
20	45	293	306	301	185	366	207	134	157	A
21	41	297	307	301	186	368	209	134	157	A
22	37	300	308	301	187	369	211	135	158	A
23	33	303	309	300	188	370	212	135	158	A
24	29	306	310	299	189	371	212	136	158	A
25	25	307	310	298	190	371	213	137	159	A
26	21	311	312	286	190	370	205	139	157	A
27	17	272	307	201	206	278	194	164	138	A

Harmonic constants for constituent S2 for deployment FASB1002.

Bin	Depth m	E-ampl mm/sec	E-gpl deg	N-ampl mm/sec	N-gpl deg	Major mm/sec	Minor mm/sec	Incl deg	Grphl deg	R
01	121	54	336	64	205	77	34	128	186	A
02	117	59	337	70	205	83	37	128	186	A
03	113	61	337	74	205	88	38	127	187	A
04	109	64	337	77	205	91	40	127	187	A
05	105	66	336	80	206	95	42	127	187	A
06	101	68	336	83	206	97	44	126	188	A
07	97	71	336	86	207	101	47	126	188	A
08	93	73	335	89	208	104	50	126	189	A
09	89	75	335	91	209	106	52	126	189	A
10	85	77	335	93	210	108	54	126	190	A
11	81	79	335	95	211	110	57	126	190	A
12	77	81	335	97	212	112	59	126	191	A
13	73	83	335	99	213	114	61	126	191	A
14	69	86	336	100	214	116	63	126	192	A
15	65	88	336	102	215	117	65	127	193	A
16	61	90	337	103	217	119	68	127	193	A
17	57	92	337	104	218	121	69	128	194	A
18	53	94	338	105	220	122	72	129	195	A
19	49	96	340	105	222	122	72	129	196	A
20	45	97	342	104	224	122	73	130	197	A
21	41	98	343	104	225	123	74	131	198	A
22	37	99	345	103	226	123	73	132	198	A
23	33	98	346	103	227	122	72	132	199	A
24	29	97	347	102	228	121	71	132	200	A
25	25	96	348	101	227	122	69	132	200	A
26	21	97	348	97	228	119	68	135	198	A
27	17	99	352	71	245	102	66	159	185	A

FASB1002 ADCP 0936

Harmonic constants for constituent N2 for deployment FASB1002.

Bin	Depth m	E-ampl mm/sec	E-gpl deg	N-ampl mm/sec	N-gpl deg	Major mm/sec	Minor mm/sec	Incl deg	Grphl deg	R
01	121	33	275	36	138	45	17	132	119	A
02	117	36	275	39	138	49	19	132	119	A
03	113	38	275	42	139	52	21	131	120	A
04	109	39	274	44	140	54	23	131	120	A
05	105	41	274	46	140	57	24	130	121	A
06	101	42	274	48	141	58	25	130	121	A
07	97	44	274	50	143	61	27	130	122	A
08	93	46	274	51	143	62	28	130	123	A
09	89	47	274	52	144	63	29	130	123	A
10	85	48	274	53	145	64	30	130	123	A
11	81	48	274	53	146	65	31	131	124	A
12	77	49	275	54	147	66	32	131	124	A
13	73	50	275	54	147	66	32	131	124	A
14	69	50	275	54	148	67	33	131	124	A
15	65	51	275	55	148	67	33	132	124	A
16	61	52	275	55	149	68	34	132	124	A
17	57	52	274	56	149	68	35	131	125	A
18	53	54	275	57	151	69	37	132	126	A
19	49	54	276	58	152	70	37	132	127	A
20	45	55	278	58	153	71	37	132	128	A
21	41	56	278	58	155	71	38	133	128	A
22	37	57	280	57	157	71	38	134	129	A
23	33	58	281	57	158	71	39	136	129	A
24	29	59	283	56	160	71	39	137	129	A
25	25	59	284	56	163	71	40	138	131	A
26	21	61	286	57	165	72	41	139	132	A
27	17	56	276	46	171	59	42	155	114	A

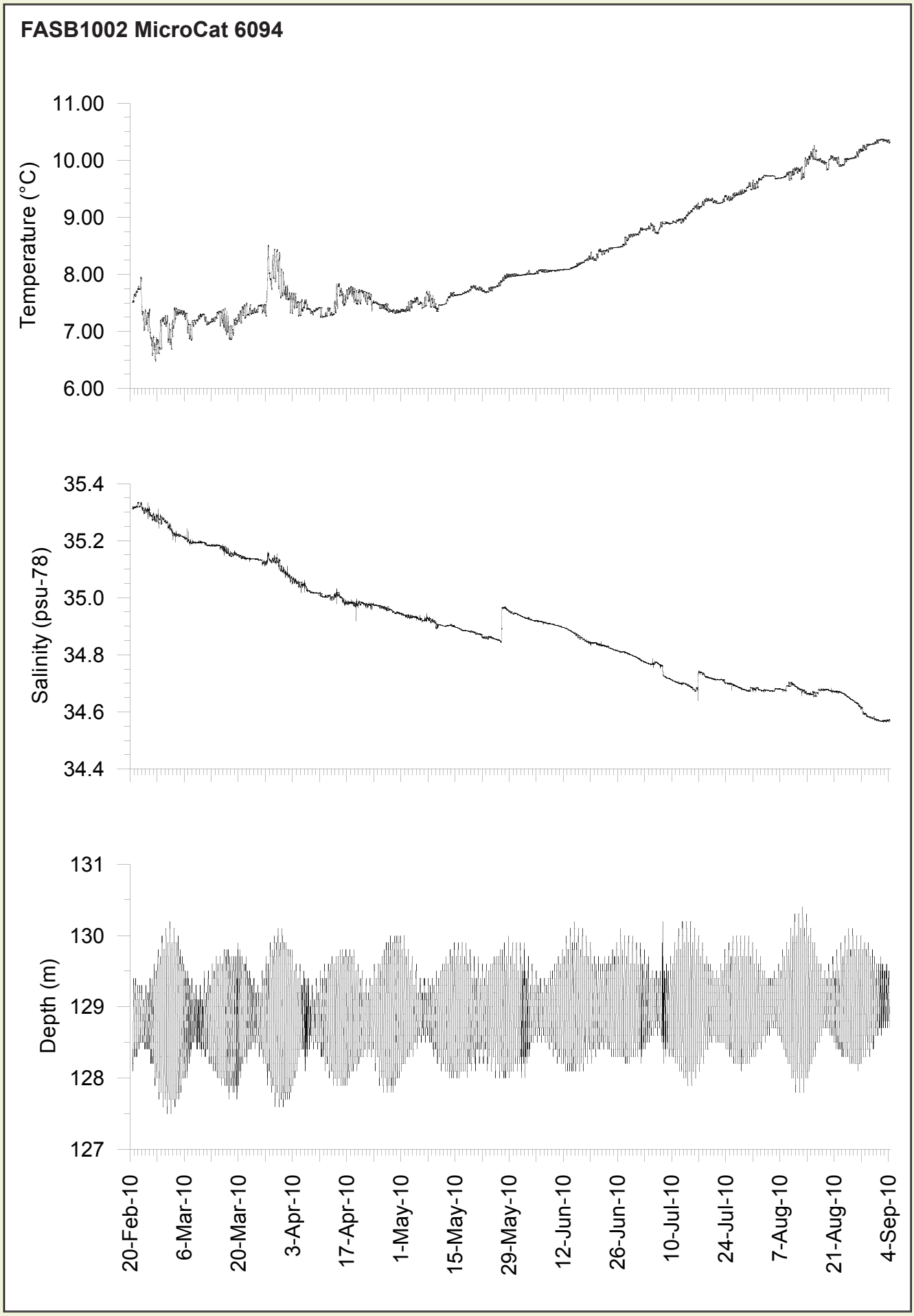
Harmonic constants for constituent O1 for deployment FASB1002.

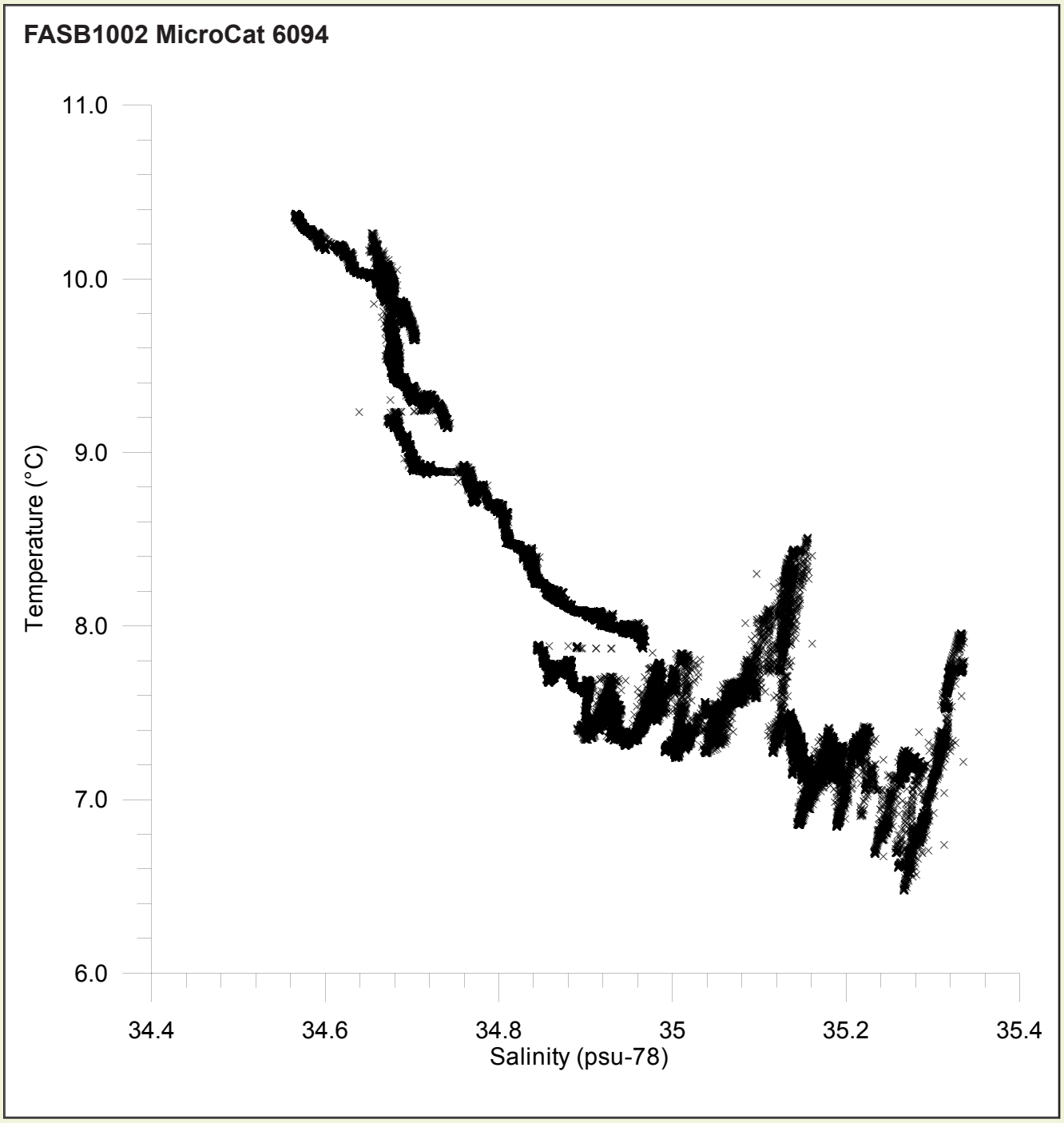
Bin	Depth m	E-ampl mm/sec	E-gpl deg	N-ampl mm/sec	N-gpl deg	Major mm/sec	Minor mm/sec	Incl deg	Grphl deg	R
01	121	22	359	7	167	23	1	163	178	C
02	117	23	360	8	167	25	2	161	178	C
03	113	24	0	9	166	25	2	160	179	C
04	109	24	1	9	167	26	2	159	179	C
05	105	25	1	10	167	27	2	158	179	C
06	101	25	1	11	169	27	2	157	179	C
07	97	25	1	11	169	27	2	156	179	C
08	93	25	1	12	170	28	2	155	179	C
09	89	25	1	12	170	28	2	155	179	C
10	85	25	1	12	170	28	2	155	179	C
11	81	25	2	12	169	28	2	154	179	C
12	77	25	2	13	169	28	2	153	179	C
13	73	25	2	13	169	28	2	153	179	C
14	69	25	2	13	169	28	3	152	179	C
15	65	24	1	13	168	28	3	152	178	C
16	61	24	1	14	168	28	3	151	178	C
17	57	24	0	14	168	27	2	150	177	C
18	53	24	359	14	169	28	2	150	177	C
19	49	24	359	13	169	27	2	151	177	C
20	45	24	359	13	170	27	2	151	177	C
21	41	23	359	13	169	26	2	151	177	C
22	37	23	360	13	170	26	2	151	177	C
23	33	22	360	12	171	25	2	151	178	C
24	29	22	1	13	171	25	2	151	179	C
25	25	23	2	13	168	26	3	151	179	C
26	21	23	3	12	168	26	3	152	179	C
27	17	18	20	19	240	25	9	134	221	A

FASB1002 ADCP 0936

Harmonic constants for constituent K1 for deployment FASB1002.

Bin	Depth m	E-ampl mm/sec	E-gpl deg	N-ampl mm/sec	N-gpl deg	Major mm/sec	Minor mm/sec	Incl deg	Grphl deg	R
01	121	24	217	15	46	29	2	148	39	A
02	117	26	218	17	46	31	2	147	40	A
03	113	27	217	18	45	32	2	146	40	A
04	109	28	218	19	45	34	2	146	40	A
05	105	29	218	20	45	35	2	145	40	A
06	101	29	218	21	44	36	2	144	40	A
07	97	29	217	22	44	36	2	143	40	A
08	93	29	217	22	44	37	2	143	40	A
09	89	29	217	23	44	37	2	142	40	A
10	85	29	217	23	44	37	2	142	39	A
11	81	29	216	23	44	37	2	141	39	A
12	77	29	216	23	44	37	3	141	39	A
13	73	29	215	24	44	37	3	140	39	A
14	69	29	215	24	44	37	3	140	39	A
15	65	28	215	24	44	37	3	139	39	A
16	61	28	215	25	44	37	3	139	39	A
17	57	28	214	25	43	37	3	138	38	A
18	53	28	214	25	42	37	3	138	37	A
19	49	27	213	25	41	36	3	138	37	A
20	45	27	212	25	41	37	3	137	37	A
21	41	26	212	26	41	37	3	136	36	A
22	37	26	212	26	42	37	3	135	37	A
23	33	26	212	26	42	37	3	134	37	A
24	29	25	211	26	40	36	3	134	36	A
25	25	25	210	25	41	35	3	135	36	A
26	21	25	208	24	44	34	5	136	36	A
27	17	28	243	29	123	35	20	133	95	A


FASB1002 MicroCat 6094
Temperature (°C)
11.00
10.00
9.00
8.00
7.00
6.00
Salinity (psu-78)
35.4
35.2
35.0
34.8
34.6
34.4
Depth (m)
131
130
129
128
127
20-Feb-10
6-Mar-10
20-Mar-10
3-Apr-10
17-Apr-10
1-May-10
15-May-10
29-May-10
12-Jun-10
26-Jun-10
10-Jul-10
24-Jul-10
7-Aug-10
21-Aug-10
4-Sep-10


FASB1002 MicroCat 6094
11.0
10.0
9.0
8.0
7.0
6.0
Temperature (°C)
34.4
34.6
34.8
35
35.2
35.4
Salinity (psu-78)

SKOP1003 data

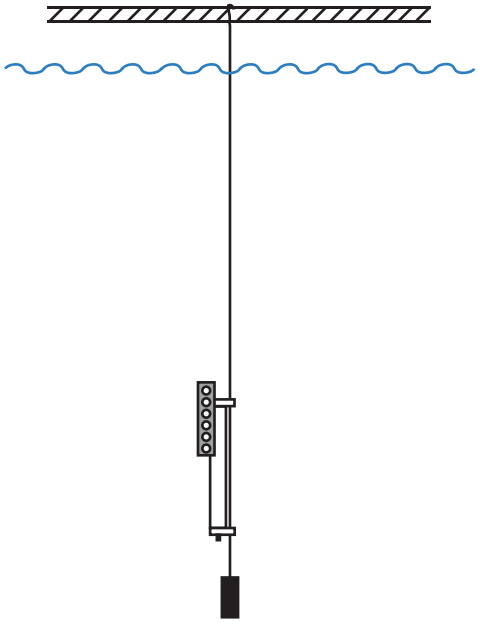
Latitude: 61°54.438´N

Longitude: 006°52.830´W

Bottom depth: 18 m

Time of deployment: 19/03-2010

Time of recovery: 11/10 - 2010 1048 UTC



Micro Cat:

Instrument no.: 4568

Time of first data: 20/03 - 2010 1205 UTC

Time of last data: 11/10 - 2010 1050 UTC

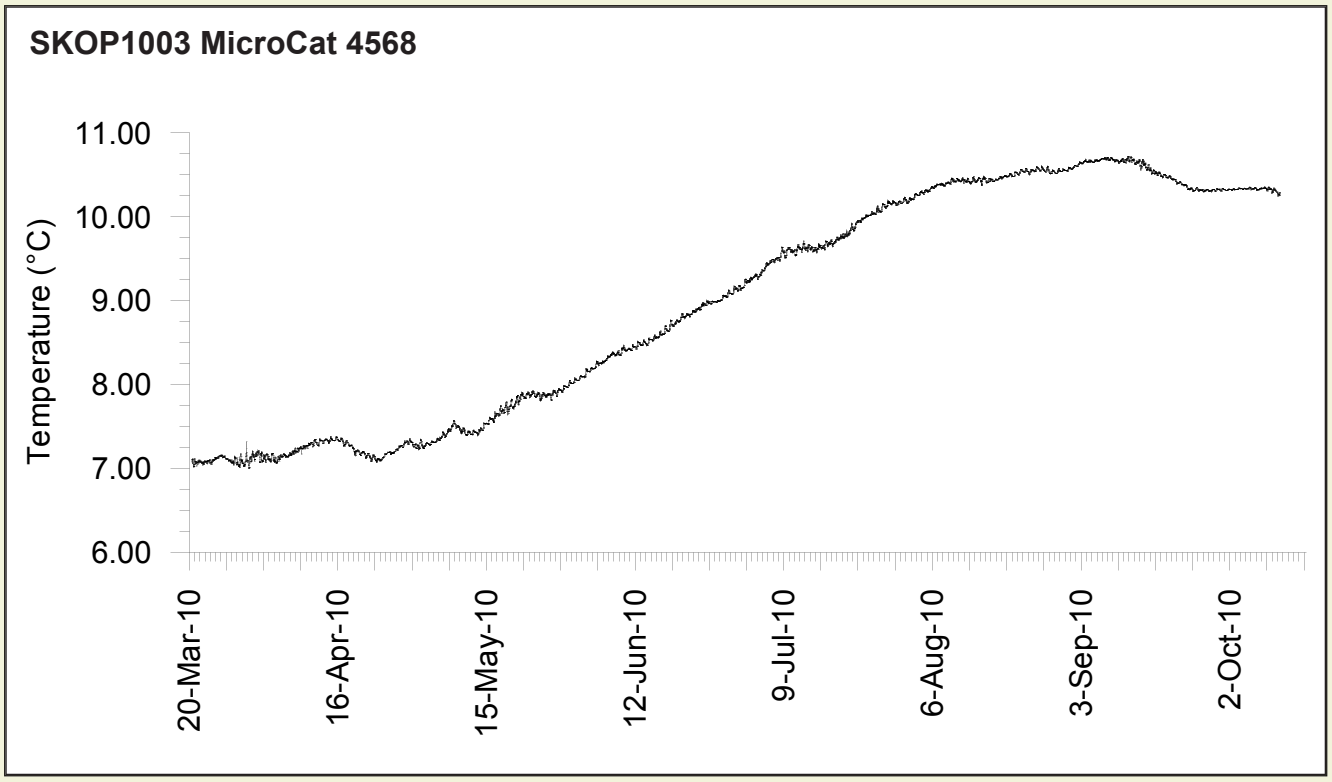
Sample interval: 5 min

No. of ensembles: 59026

Instrument depth: 4 m

Data:

Temperature data are ok, but the salinity measurements failed most likely due to trapped air in the conductivity cell.


SKOP1003 MicroCat 4568
Temperature (°C)
11.00
10.00
9.00
8.00
7.00
6.00
20-Mar-10
16-Apr-10
15-May-10
12-Jun-10
9-Jul-10
6-Aug-10
3-Sep-10
2-Oct-10

FASB1004 data

Latitude: 61°54.000´N
Longitude: 007°34.900´W
Echo sounding depth: 125m
Bottom depth corr.: 128m
Time of deployment: 21/04 -2010 17:42UTC
Time of recovery: 23/04 - 2010 05:03UTC

Aanderaa (FASB1004-048):

Instrument no.: RCM7 9494
Height above bottom: 80m
Depth: 48m (corr.)
Time of first data: 21/04 – 2010 17:47 UTC
Time of last data: 23/04 – 2010 04:57 UTC
Sample interval: 5 min
No. of records: 423

Starmon (FASB1004-073):

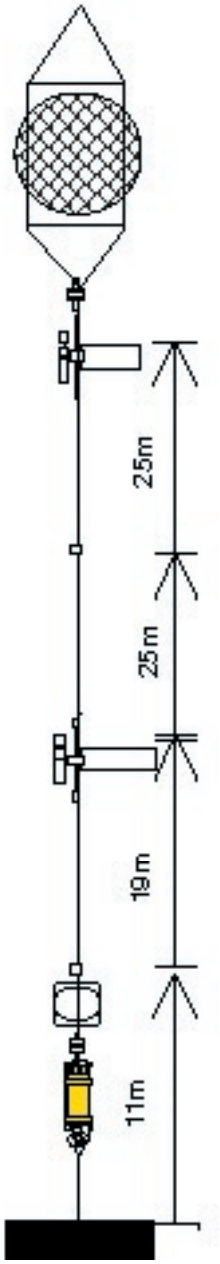
Instrument no.: 0658
Height above bottom: 55m
Depth: 73m (corr.)
Time of first data: 21/04 – 2010 17:47 UTC
Time of last data: 23/04 – 2010 04:57 UTC
Sample interval: 1 min
No. of records: 2111

Aanderaa (FASB1004-098):

Instrument no.: RCM7 9741
Height above bottom: 30m
Depth: 98m (corr.)
Time of first data: 21/04 – 2010 17:47 UTC
Time of last data: 23/04 – 2010 04:57 UTC
Sample interval: 5 min
No. of records: 423

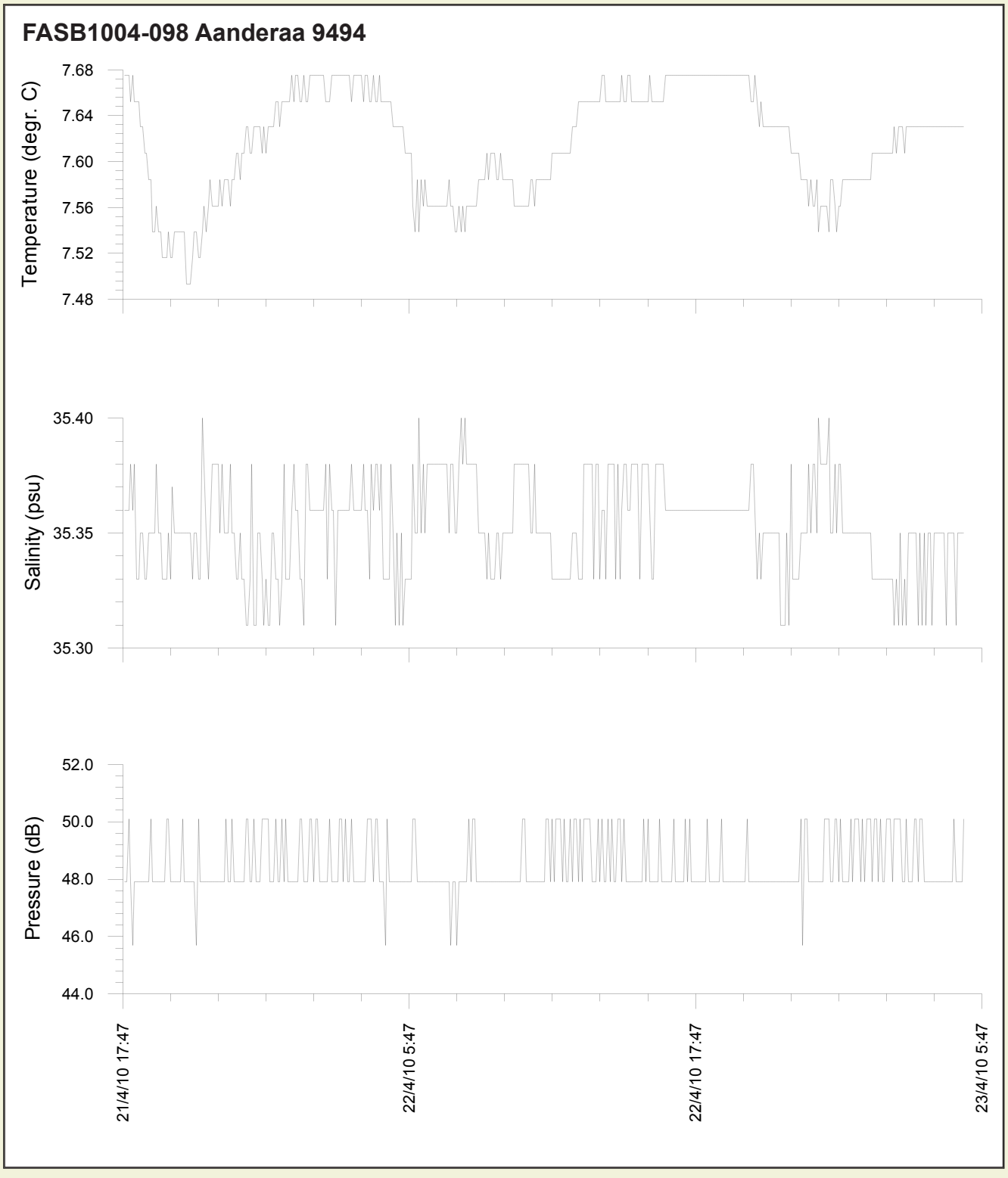
Starmon (FASB1004-117):

Instrument no.: 0659
Height above bottom: 11m
Depth: 117m (corr.)
Time of first data: 21/04 – 2010 17:47 UTC
Time of last data: 23/04 – 2010 04:57 UTC
Sample interval: 1 min
No. of records: 2111



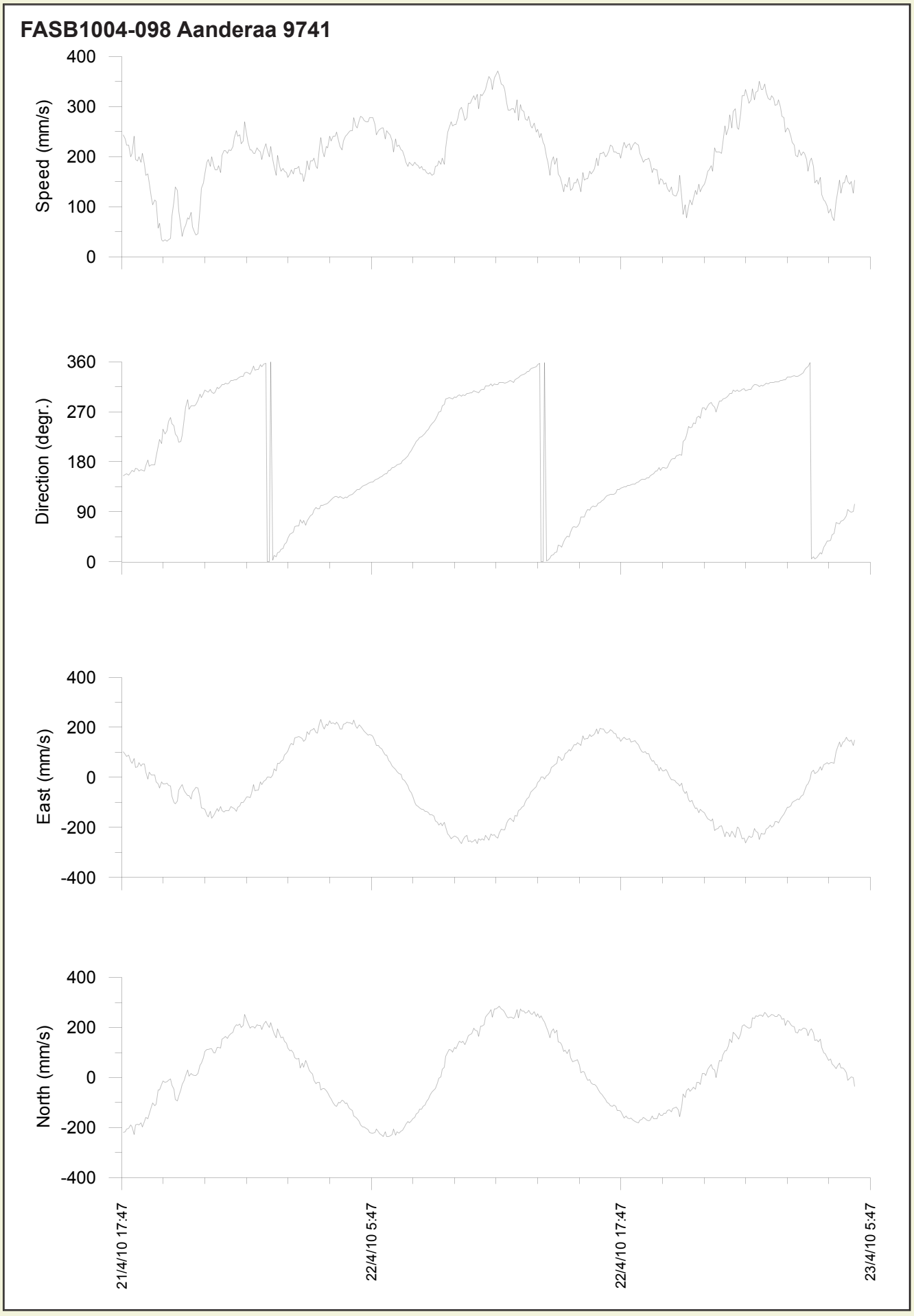
Data:

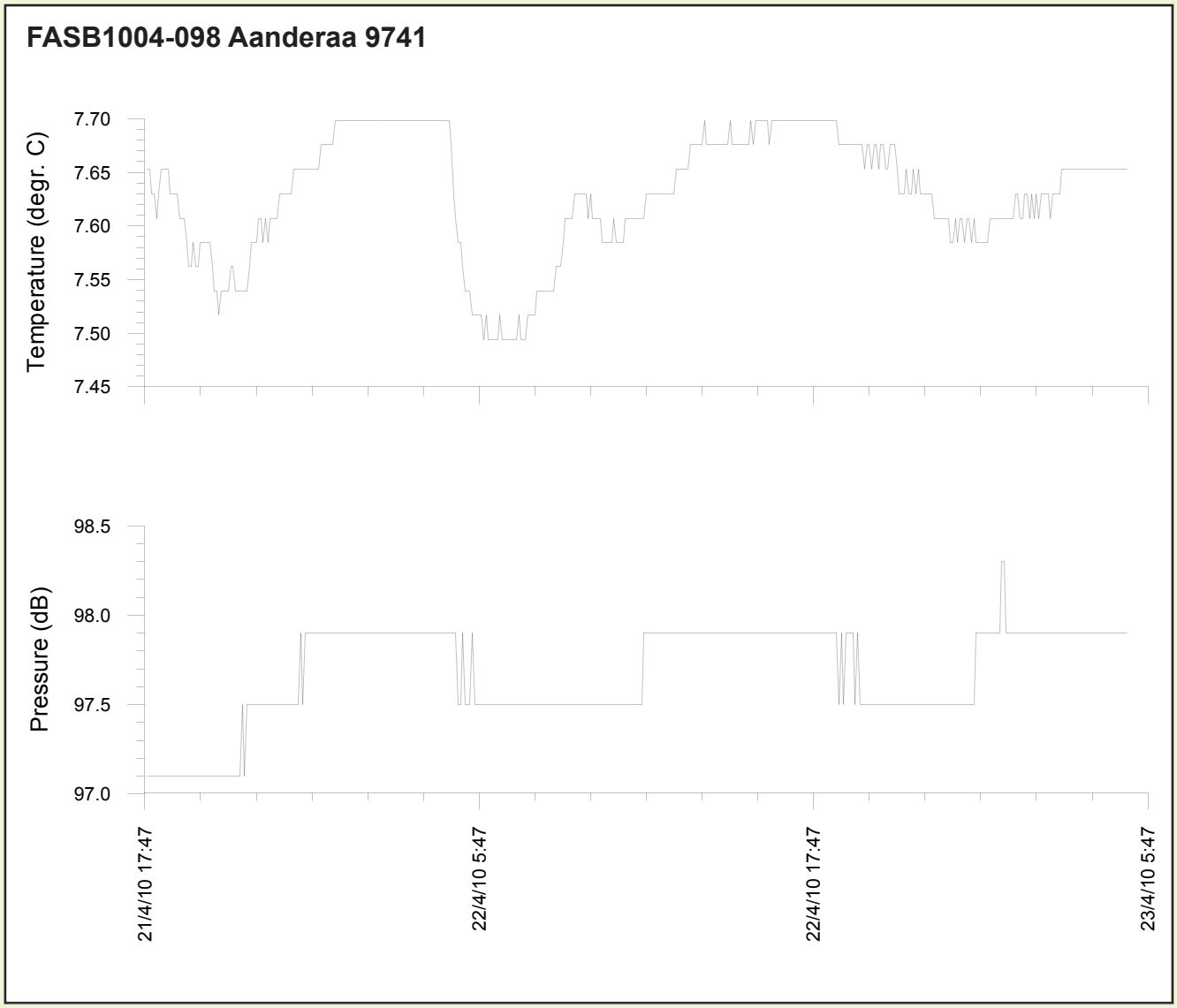
Ok, but the rotor of the 9494 Aanderaa (048) was missing and therefore there is no speed in these data.


FASB1004-098 Aanderaa 9494
Temperature (degr. C)
7.68
7.64
7.60
7.56
7.52
7.48
Salinity (psu)
35.40
35.35
35.30
Pressure (dB)
52.0
50.0
48.0
46.0
44.0
21/4/10 17:47
22/4/10 5:47
22/4/10 17:47
23/4/10 5:47

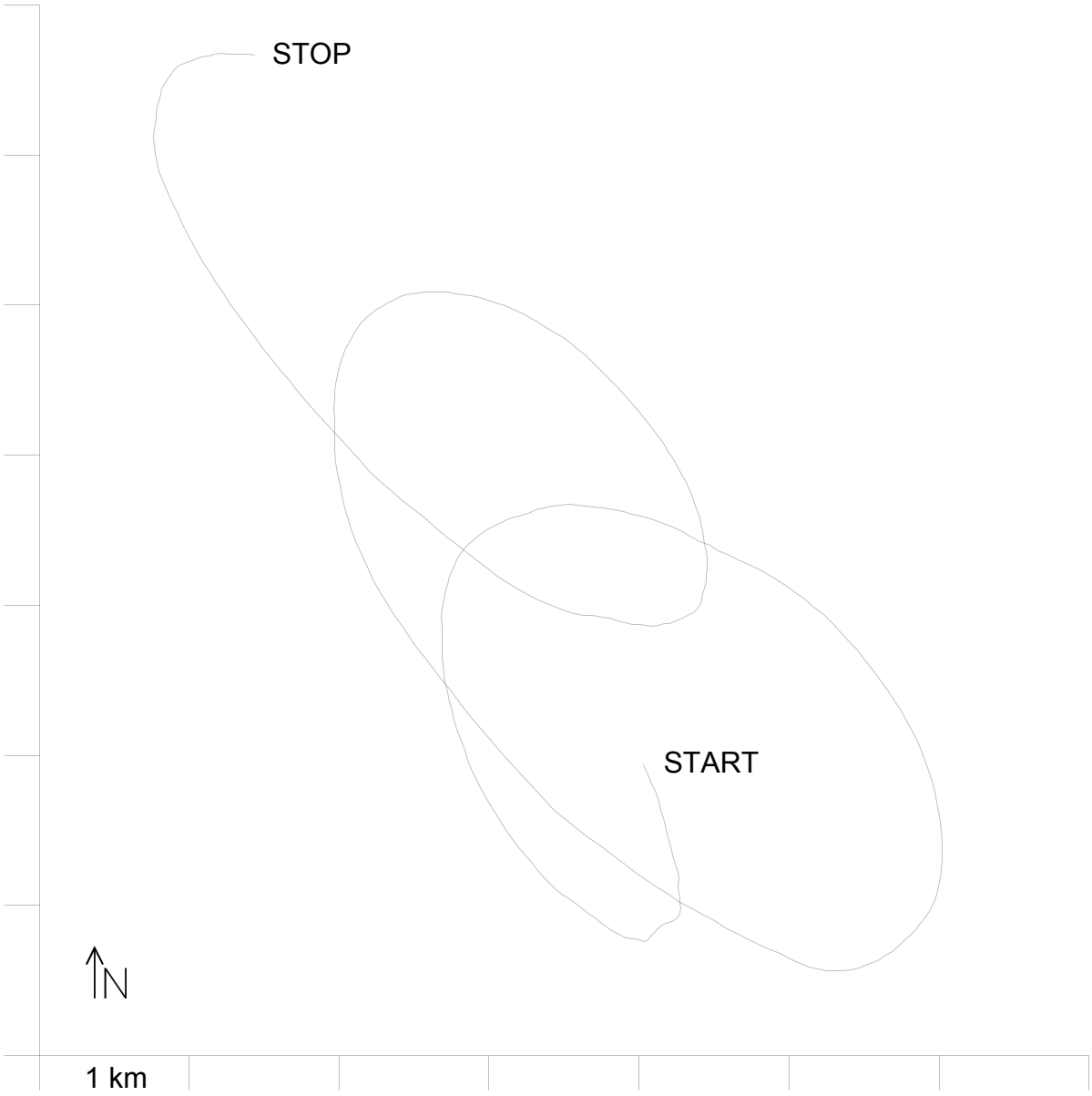
FASB1004-098 Aanderaa 9741

```
Deployment: FASB1004          analyzed from beginning to end
Instrument no.:  9741
Instrument type: Aanderaa
Latitude: 61 54.000 N
Longitude:07 34.900 W
Bottom depth:  128
Instrument depth:   98
Number of records:  423
Time of first record: 2010 04 21 17 47
Time of last record : 2010 04 23 04 57
Time between records (min.):  5.000

Parameters            Records OK    Records flagged
----------            ----------    ---------------
Column  1   : Recno
Column  2- 4: Date
Column  5- 6: Time
Column  7   : Temp          423               0
Column  8   : Speed         423               0
Column  9   : Direct        423               0

Comments
--------

Residual current:  42 mm/sec towards: 331 degrees
-----------------

TIDAL ANALYSIS
--------------
Error flagged records interpolated for velocity:     0, records not int.:     0
Tidal analysis on data passed through 3 filters: A12, A12, and A13
================================================================================
Const     Freq      E-ampl   E-gpl  N-ampl   N-gpl   Major   Minor    Incl   Grphl  R
          c/hr      mm/sec     deg  mm/sec     deg  mm/sec  mm/sec     deg     deg
--------------------------------------------------------------------------------
O1     .03873065        41     300      35     180      47      27     144     143  A  I
K1     .04178075        39     173      33      53      44      25     144      15  A
M2     .08051140       307     302     347     173     420     197     130     152  A
S2     .08333334       102     341     124     207     148      61     127     190  A  I
M4     .16102280         9     189       3     173      10       1      19     187  A


DIRECTIONAL CURRENT DISTRIBUTION (for all nonflagged observations in series)
--------------------------------
Relative number of observations in parts per thousand (ppt) grouped into speed and
direction intervals (of 30 degree width centred around the directions shown)
================================================================================
    Speed     |                   Direction intervals                    | All dir.
  intervals   |---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
   (mm/s)     | 15   45   75   105  135  165  195  225  255  285  315  345| Tot  Acc
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
    0 -   50  |   0    0    0    0    0    0    0   12    5    7    0    0|  24   24
   50 -  100  |   0    9    0    0    0    0    2   12    5   12    2    0|  43   66
  100 -  150  |  14   12   31    5    0   21   17    7   21    7    2    0| 137  203
  150 -  200  |  47   17   38   31    9   38   19   21   14   19   24   12| 288  492
  200 -  300  |   9    0    0   54   78   47    2    0    2   47   66   92| 400  891
  300 -  400  |   0    0    0    0    0    0    0    0    0    0  106    2| 109 1000
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
Total    (ppt)|  71   38   69   90   87  106   40   52   47   92  201  106|
Rel.flux (ppt)|  61   25   52   90  101  101   30   29   29   85  277  121|
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
Avg.spd (mm/s)| 176  134  156  206  237  194  152  115  127  189  284  234|
Max.spd (mm/s)| 246  174  191  252  281  258  212  188  209  299  371  304|
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
```

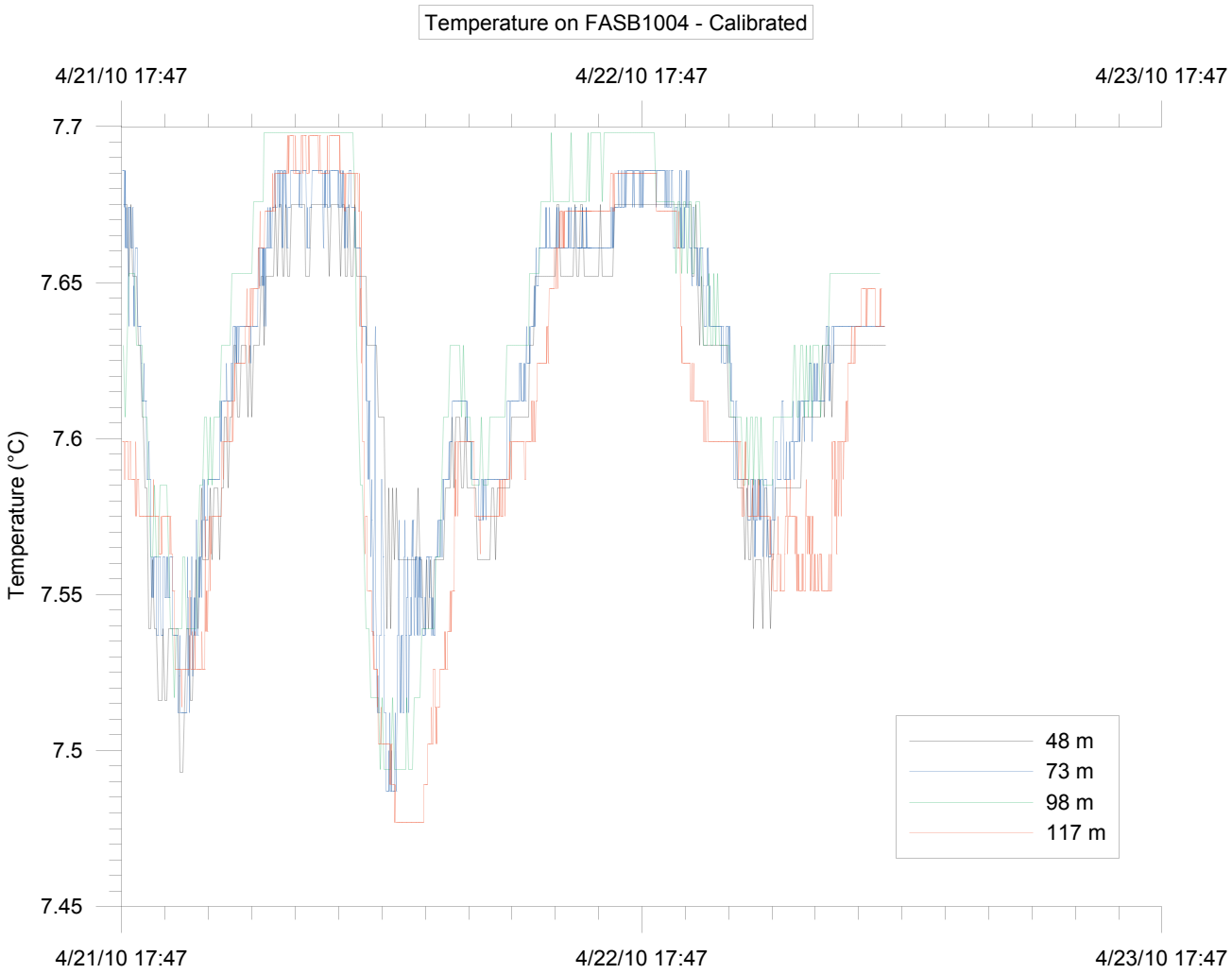

FASB1004-098 Aanderaa 9741
Speed (mm/s)
400
300
200
100
0
Direction (degr.)
360
270
180
90
0
East (mm/s)
400
200
0
-200
-400
North (mm/s)
400
200
0
-200
-400
21/4/10 17:47
22/4/10 5:47
22/4/10 17:47
23/4/10 5:47


FASB1004-098 Aanderaa 9741
Temperature (degr. C)
7.70
7.65
7.60
7.55
7.50
7.45
Pressure (dB)
98.5
98.0
97.5
97.0
21/4/10 17:47
22/4/10 5:47
22/4/10 17:47
23/4/10 5:47

FASB1004-098 Aanderaa 9741

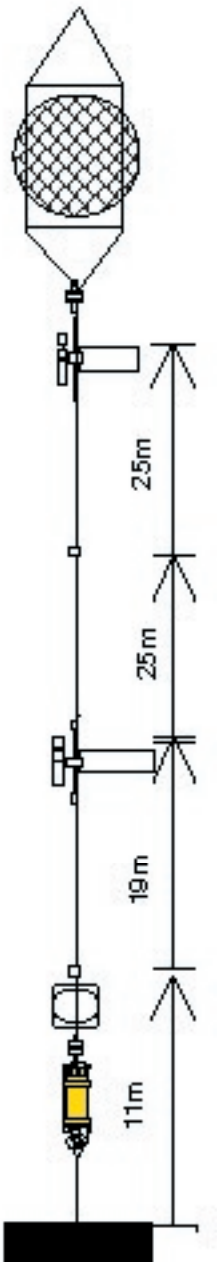


FASB1004 All instruments



VAGA1004 data

Latitude: 62°00.000´N
Longitude: 007°35.000´W
Echo sounding depth: 103m
Bottom depth corr.: 106m
Time of deployment: 23/04 -2010 06:49UTC
Time of recovery: 26/04 - 2010 07:35UTC



Aanderaa (VAGA1004-026):

Instrument no.: RCM7 9494
Height above bottom: 80m
Depth: 26m (corr.)
Time of first data: 23/04 – 2010 06:32 UTC
Time of last data: 26/04 – 2010 07:27 UTC
Sample interval: 5 min
No. of records: 876

Starmon:

Instrument no.: 0658
No data due to instrument failure

Aanderaa (VAGA1004-076):

Instrument no.: RCM7 9741
Height above bottom: 30m
Depth: 76m (corr.)
Time of first data: 23/04 – 2010 06:32 UTC
Time of last data: 26/04 – 2010 07:27 UTC
Sample interval: 5 min
No. of records: 876

Starmon (VAGA1004-095):

Instrument no.: 0659
Height above bottom: 11m
Depth: 95m (corr.)
Time of first data: 23/04 – 2010 06:32 UTC
Time of last data: 26/04 – 2010 07:27 UTC
Sample interval: 1 min
No. of records: 4376

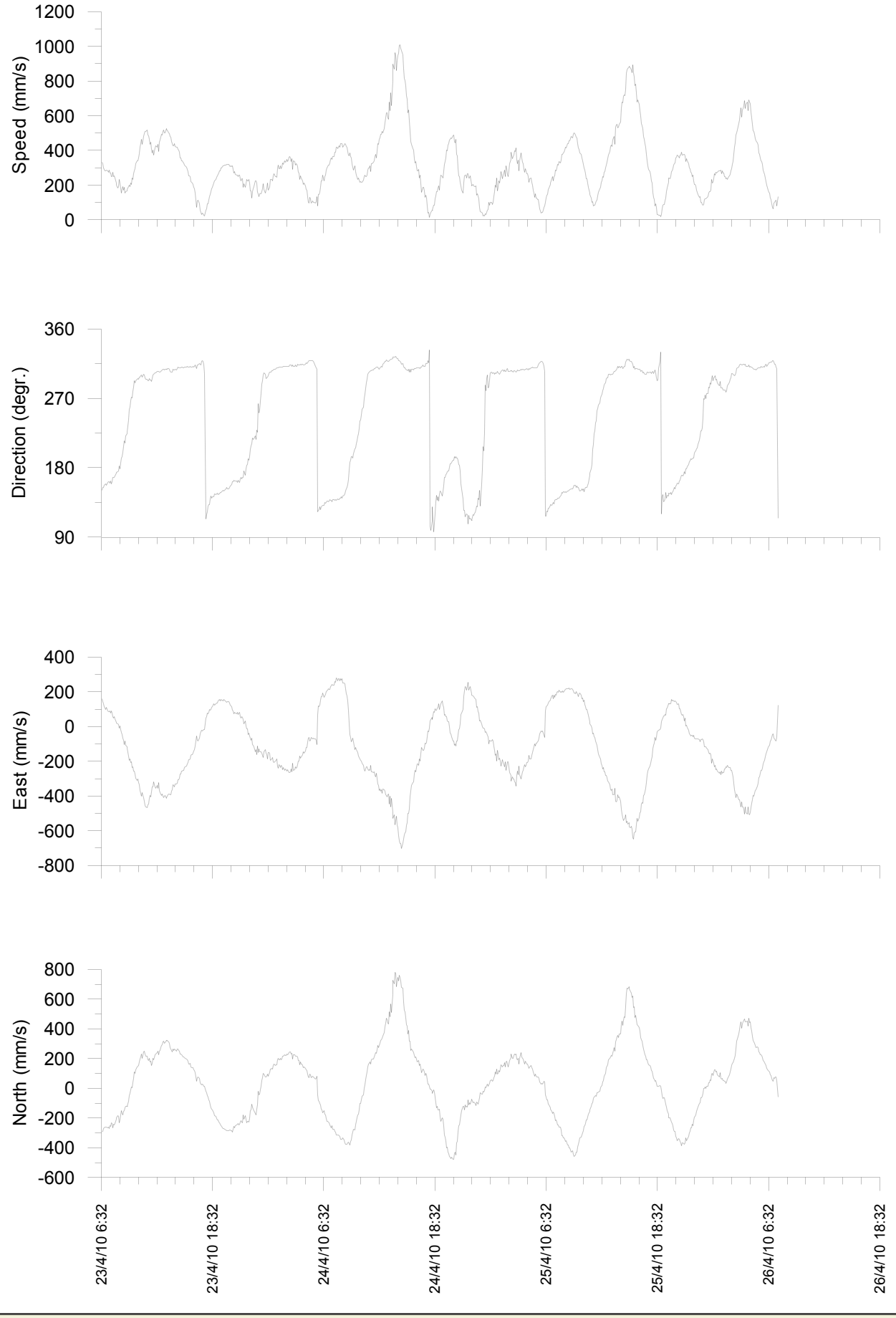
Data:

Starmon 0658 had an instrument failure. One of the Aanderaa 9494 (026) tail fins is known to be broken and one of the Aanderaa 9741 (076) tail fins is suspected to be broken, but this can't be confirmed. Velocity data from the two instruments are similar though, but must be analysed with caution.

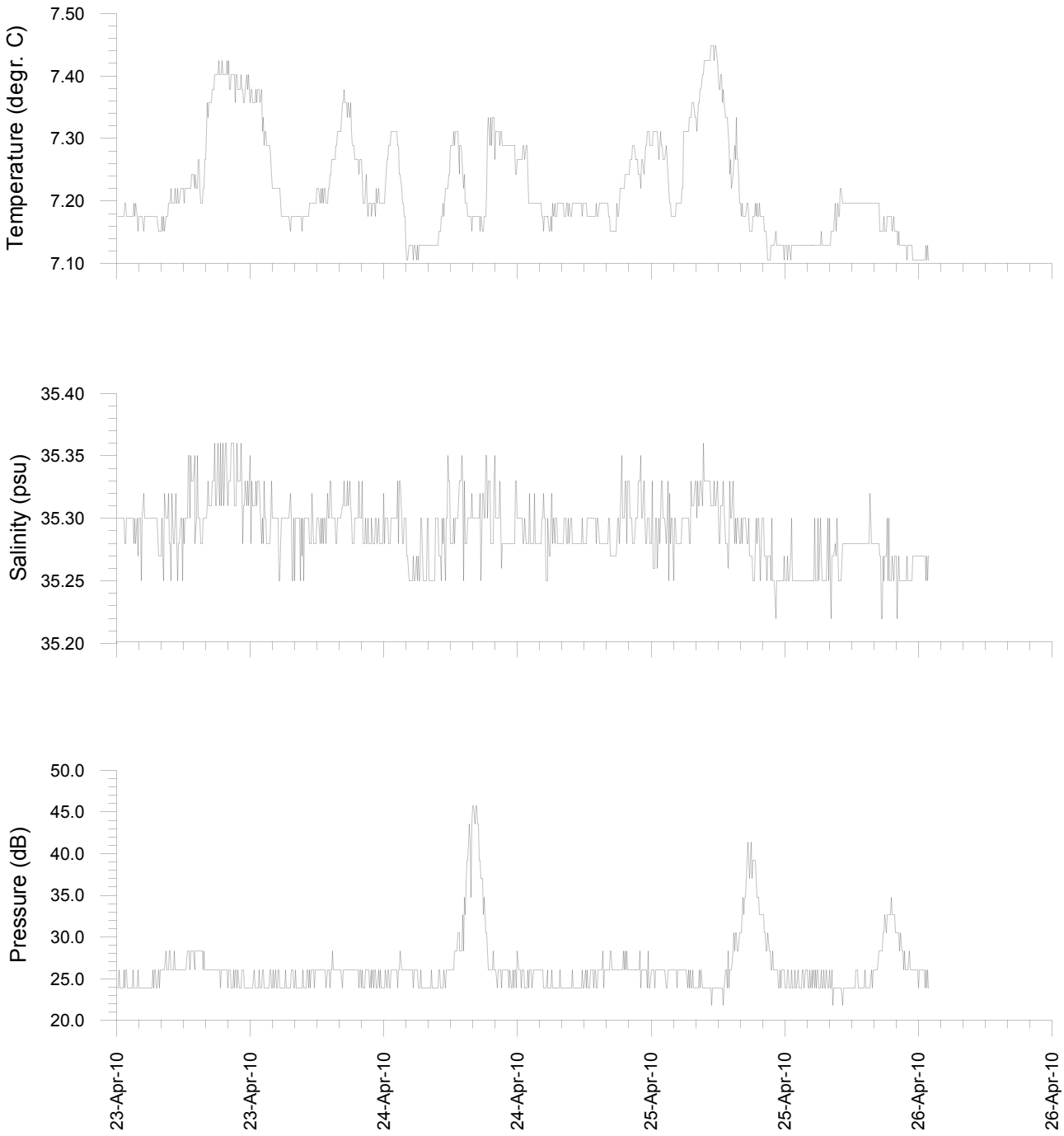
VAGA1004-026 Aanderaa 9494

```
Deployment: VAGA1004          analyzed from beginning to end
Instrument no.:  9494
Instrument type: Aanderaa
Latitude: 62 00.000 N
Longitude:07 35.000 W
Bottom depth:  106
Instrument depth:   26
Number of records:  876
Time of first record: 2010 04 23 06 32
Time of last record : 2010 04 26 07 27
Time between records (min.):  5.000

Parameters             Records OK    Records flagged
----------             ----------    ---------------
Column  1   : Recno
Column  2- 4: Date
Column  5- 6: Time
Column  7   : Temp           876                0
Column  8   : Speed          876                0
Column  9   : Direct         876                0
Column 10   : Salt           876                0
Column 11   : Press          876                0


Comments
--------


Residual current: 133 mm/sec towards: 285 degrees
-----------------


TIDAL ANALYSIS
--------------
Error flagged records interpolated for velocity:     0, records not int.:     0
Tidal analysis on data passed through 3 filters: A12, A12, and A13
================================================================================
Const     Freq      E-ampl   E-gpl  N-ampl   N-gpl   Major   Minor    Incl   Grphl  R
          c/hr      mm/sec     deg  mm/sec     deg  mm/sec  mm/sec     deg     deg
--------------------------------------------------------------------------------
O1     .03873065        44     330      39     145      58       3     139     148  C  I
K1     .04178075        42     204      36      18      55       3     139      21  C
M2     .08051140       363     330     419     159     553      44     131     156  A
S2     .08333334       124      13     157     195     200       3     128     194  A  I
M4     .16102280        44     241      20     116      46      16     163      68  A


DIRECTIONAL CURRENT DISTRIBUTION (for all nonflagged observations in series)
--------------------------------
Relative number of observations in parts per thousand (ppt) grouped into speed and
direction intervals (of 30 degree width centred around the directions shown)
================================================================================
    Speed     |                     Direction intervals                     | All dir.
  intervals   |---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
    (mm/s)    | 15   45   75   105  135  165  195  225  255  285  315  345| Tot  Acc
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
    0 -   50  |   0    0    0    3    1    2    2    1    0    6   16    1|  33   33
   50 -  100  |   0    0    0    6    9    1    1    7    2    5   27    0|  58   91
  100 -  150  |   0    0    0    5   15    2    3    3    8    6   33    0|  75  167
  150 -  200  |   0    0    0    2   23   10   11   10    8   11   31    0| 107  274
  200 -  300  |   0    0    0   11   47   45   21    9    8   51   89    0| 281  555
  300 -  400  |   0    0    0    0   29   50   14    0    0   11   90    0| 194  749
  400 -  500  |   0    0    0    0   22   23    9    0    0   18   58    0| 130  879
  500 -  600  |   0    0    0    0    0    0    0    0    0    3   41    0|  45  924
  600 -  700  |   0    0    0    0    0    0    0    0    0    0   33    0|  33  957
  700 -  800  |   0    0    0    0    0    0    0    0    0    0   13    0|  13  969
  800 -  900  |   0    0    0    0    0    0    0    0    0    0   19    0|  19  989
  900 - 1000  |   0    0    0    0    0    0    0    0    0    0    9    0|   9  998
 1000 - 1100  |   0    0    0    0    0    0    0    0    0    0    2    0|   2 1000
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
Total    (ppt)|   0    0    0   27  145  134   62   31   26  112  462    1|
Rel.flux (ppt)|   0    0    0   14  121  132   53   16   14   96  554 0.06|
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
Avg.spd (mm/s)|   0    0    0  157  260  310  267  162  167  269  374   16|
Max.spd (mm/s)|   0    0    0  266  441  500  487  258  248  516 1008   16|
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
```

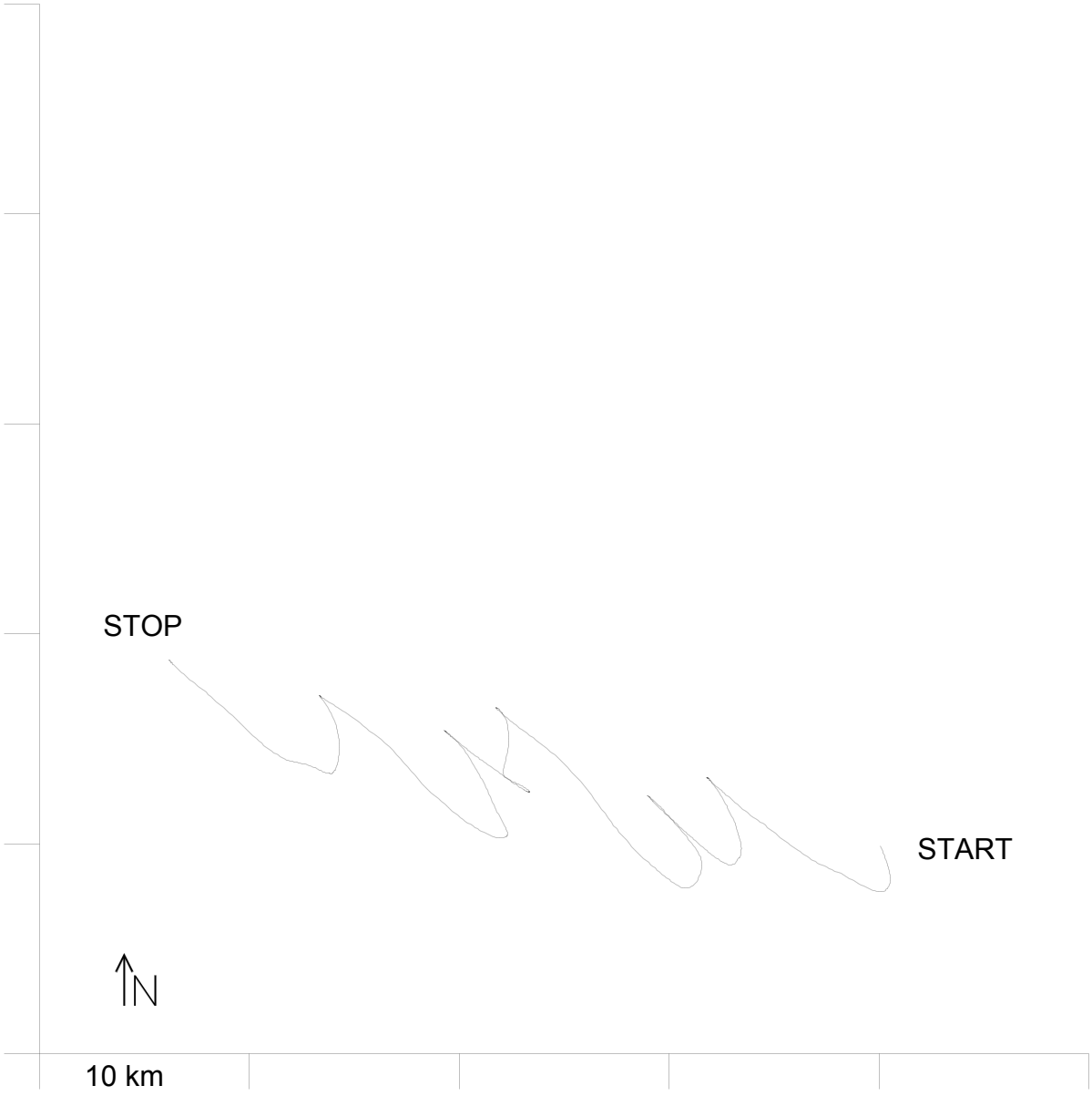
VAGA1004-026 Aanderaa 9494



VAGA1004-026 Aanderaa 9494

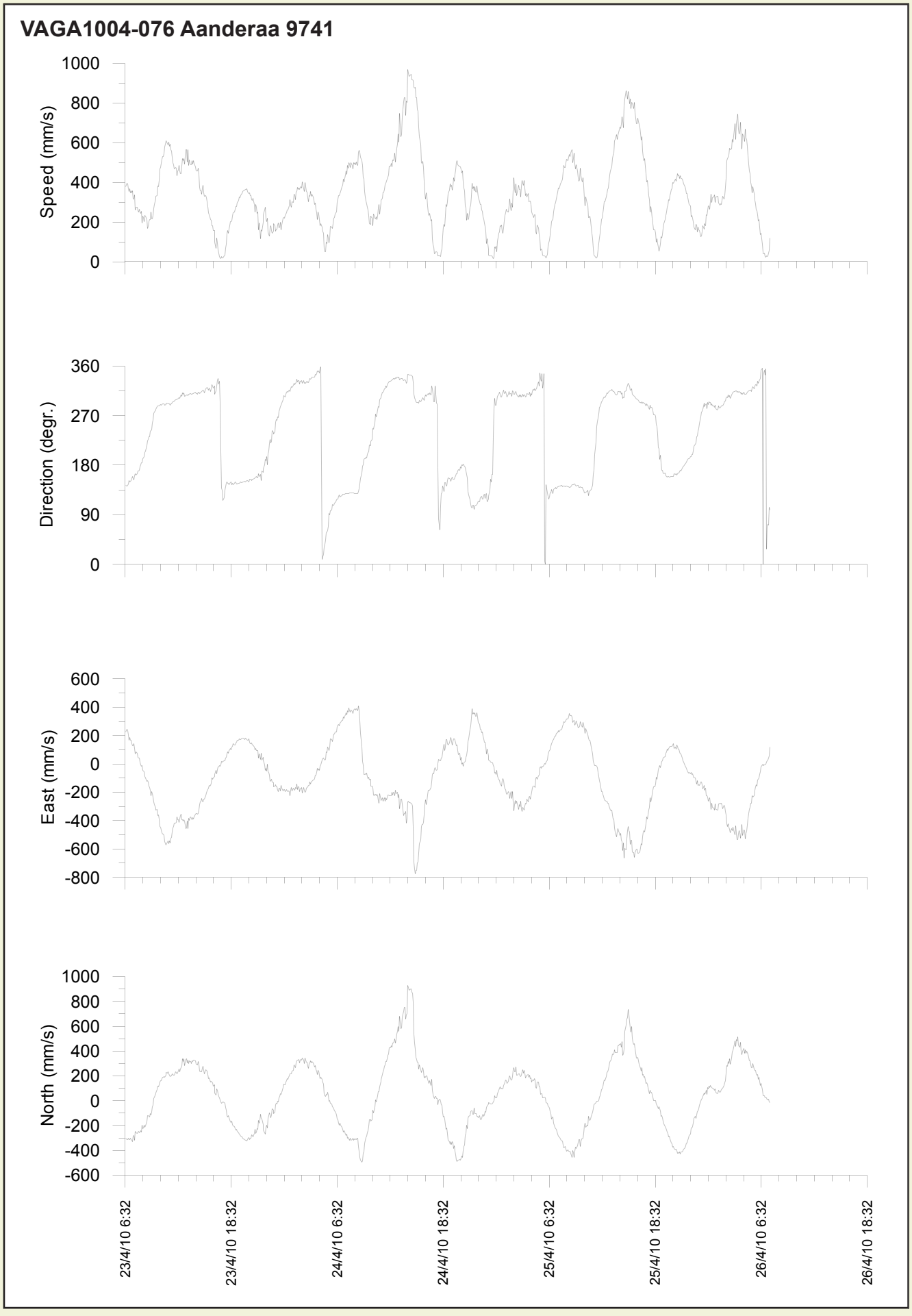


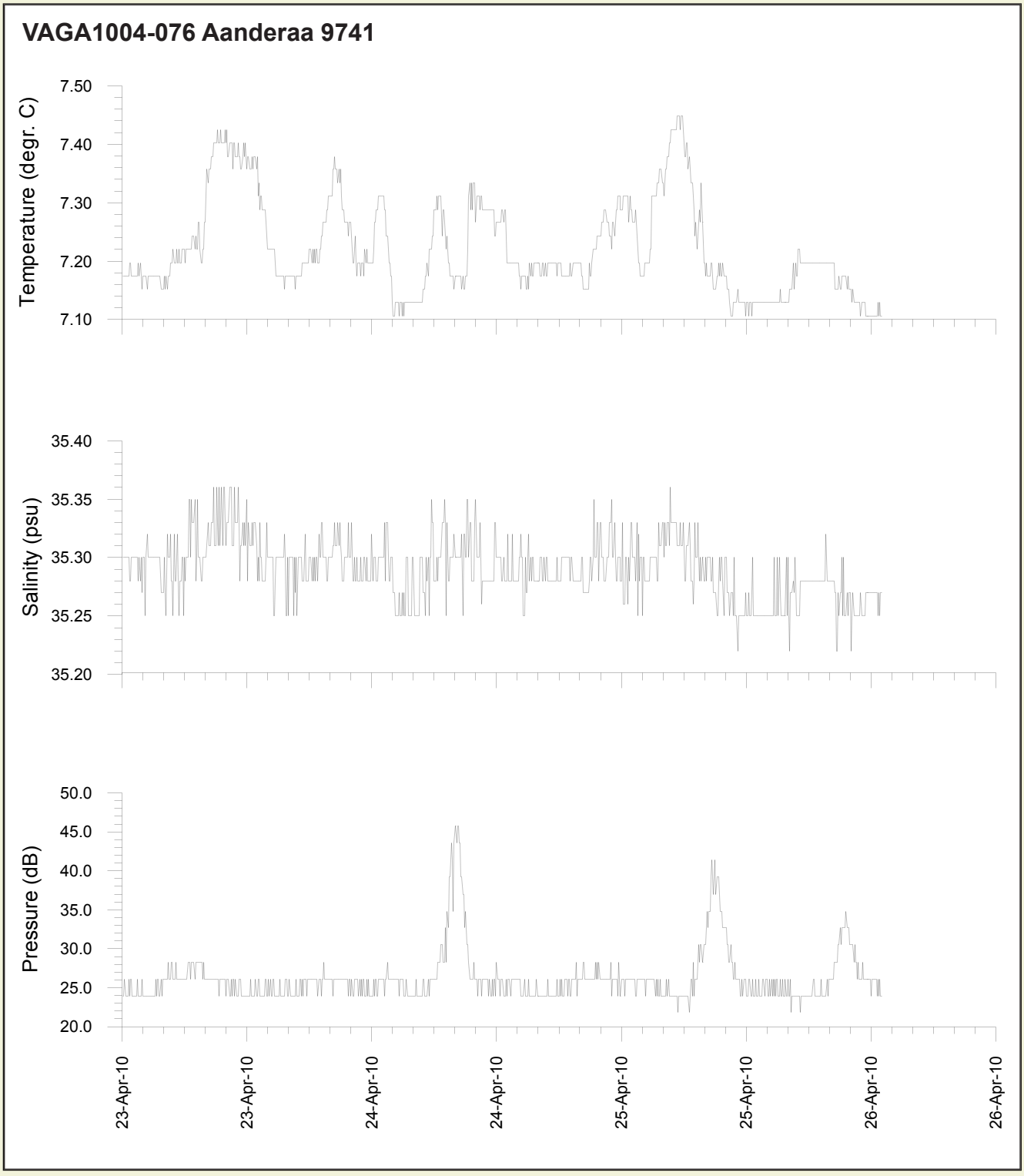
VAGA1004-026 Aanderaa 9494



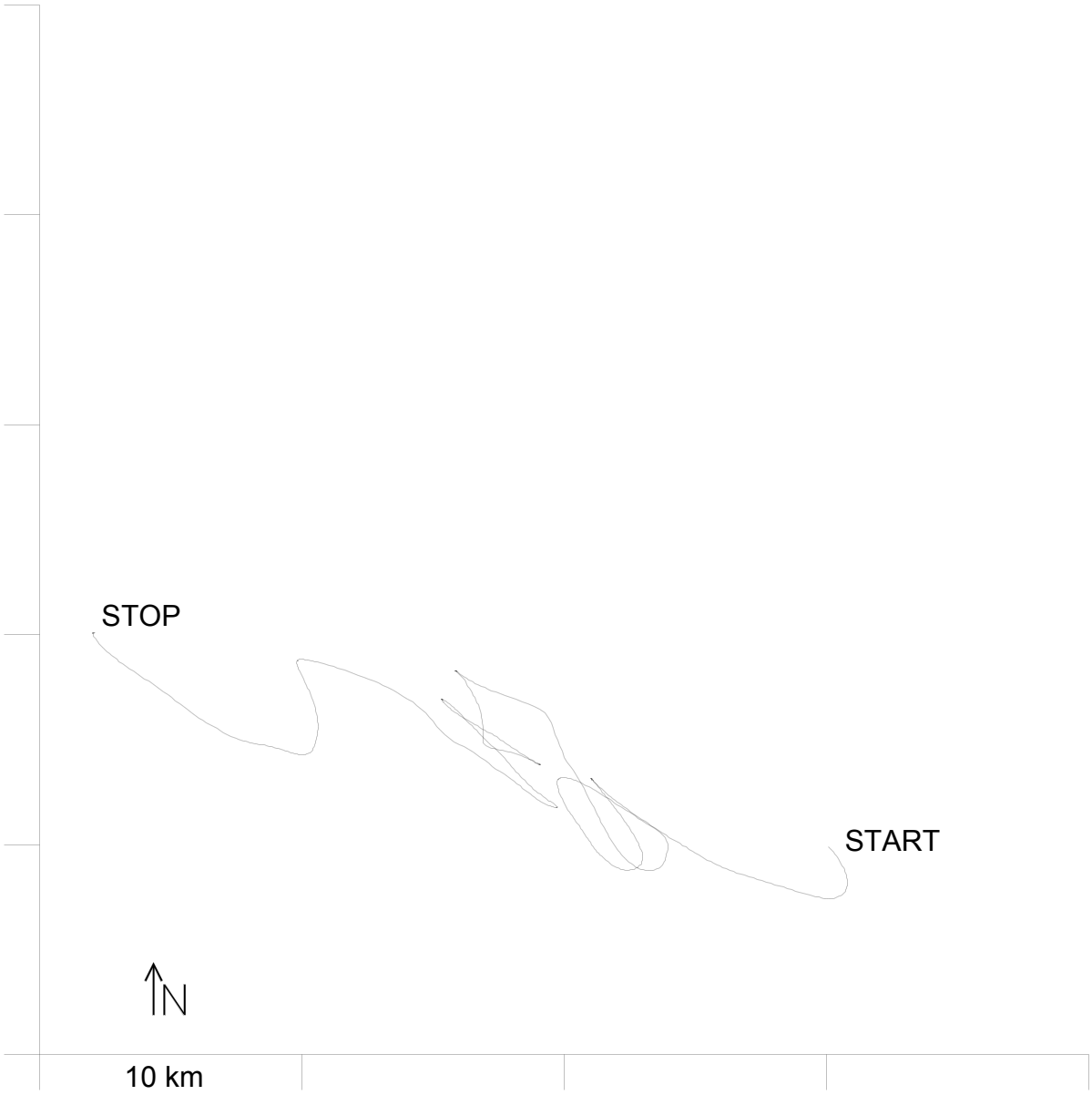
VAGA1004-076 Aanderaa 9741

```
Deployment: VAGA1004          analyzed from beginning to end
Instrument no.:  9741
Instrument type: Aanderaa
Latitude: 62 00.000 N
Longitude:07 35.000 W
Bottom depth:  106
Instrument depth:   76
Number of records:  876
Time of first record: 2010 04 23 06 32
Time of last record : 2010 04 26 07 27
Time between records (min.):  5.000

Parameters            Records OK    Records flagged
----------            ----------    ---------------
Column  1   : Recno
Column  2- 4: Date
Column  5- 6: Time
Column  7   : Temp          876               0
Column  8   : Speed         876               0
Column  9   : Direct        876               0

Comments
--------


Residual current: 113 mm/sec towards: 290 degrees
----------------


TIDAL ANALYSIS
--------------
Error flagged records interpolated for velocity:     0, records not int.:     0
Tidal analysis on data passed through 3 filters: A12, A12, and A13
================================================================================
Const     Freq      E-ampl   E-gpl  N-ampl   N-gpl   Major   Minor    Incl   Grphl  R
          c/hr      mm/sec     deg  mm/sec     deg  mm/sec  mm/sec     deg     deg
--------------------------------------------------------------------------------
O1     .03873065        51     346      39     134      62      17     143     154  C  I
K1     .04178075        48     219      37       7      58      16     144      28  C
M2     .08051140       400     330     460     157     608      38     131     154  A
S2     .08333334       137      13     172     192     220       1     128     192  C  I
M4     .16102280        44     270      19     101      48       3     157      92  A


DIRECTIONAL CURRENT DISTRIBUTION (for all nonflagged observations in series)
-------------------------------
Relative number of observations in parts per thousand (ppt) grouped into speed and
direction intervals (of 30 degree width centred around the directions shown)
================================================================================
    Speed     |                    Direction intervals                    | All dir.
  intervals   |---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
    (mm/s)    | 15   45   75   105  135  165  195  225  255  285  315  345| Tot  Acc
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
    0 -   50  |   5    2    6    2   10    6    2    2    2    7    5    7|  56   56
   50 -  100  |   0    3    0    5    7    1    3    2    2    5    6    7|  41   97
  100 -  150  |   1    0    3    2    8    3    3    2    6    5   10    3|  48  145
  150 -  200  |   2    0    0    6   11    9    1   16   10   15   11    5|  87  232
  200 -  300  |   0    0    0   10   38   26   26    6   10   33   55   11| 216  447
  300 -  400  |   0    0    0   16   37   43   10    0    0   25   78   19| 228  676
  400 -  500  |   0    0    0    0   46   30    3    0    0   21   41    5| 145  821
  500 -  600  |   0    0    0    0   16    3    0    0    0   19   29    9|  76  897
  600 -  700  |   0    0    0    0    0    0    0    0    0   14   31    5|  49  946
  700 -  800  |   0    0    0    0    0    0    0    0    0    5   14    5|  23  969
  800 -  900  |   0    0    0    0    0    0    0    0    0    3   14    5|  22  991
  900 - 1000  |   0    0    0    0    0    0    0    0    0    0    0    9|   9 1000
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
Total    (ppt)|   8    6    9   41  172  122   50   29   31  151  292   89|
Rel.flux (ppt)|   2    1    2   29  163  114   36   13   15  164  352  109|
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
Avg.spd (mm/s)|  87   70   67  239  323  321  244  161  165  373  412  418|
Max.spd (mm/s)| 174   98  136  397  563  528  424  229  252  880  877  967|
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
```

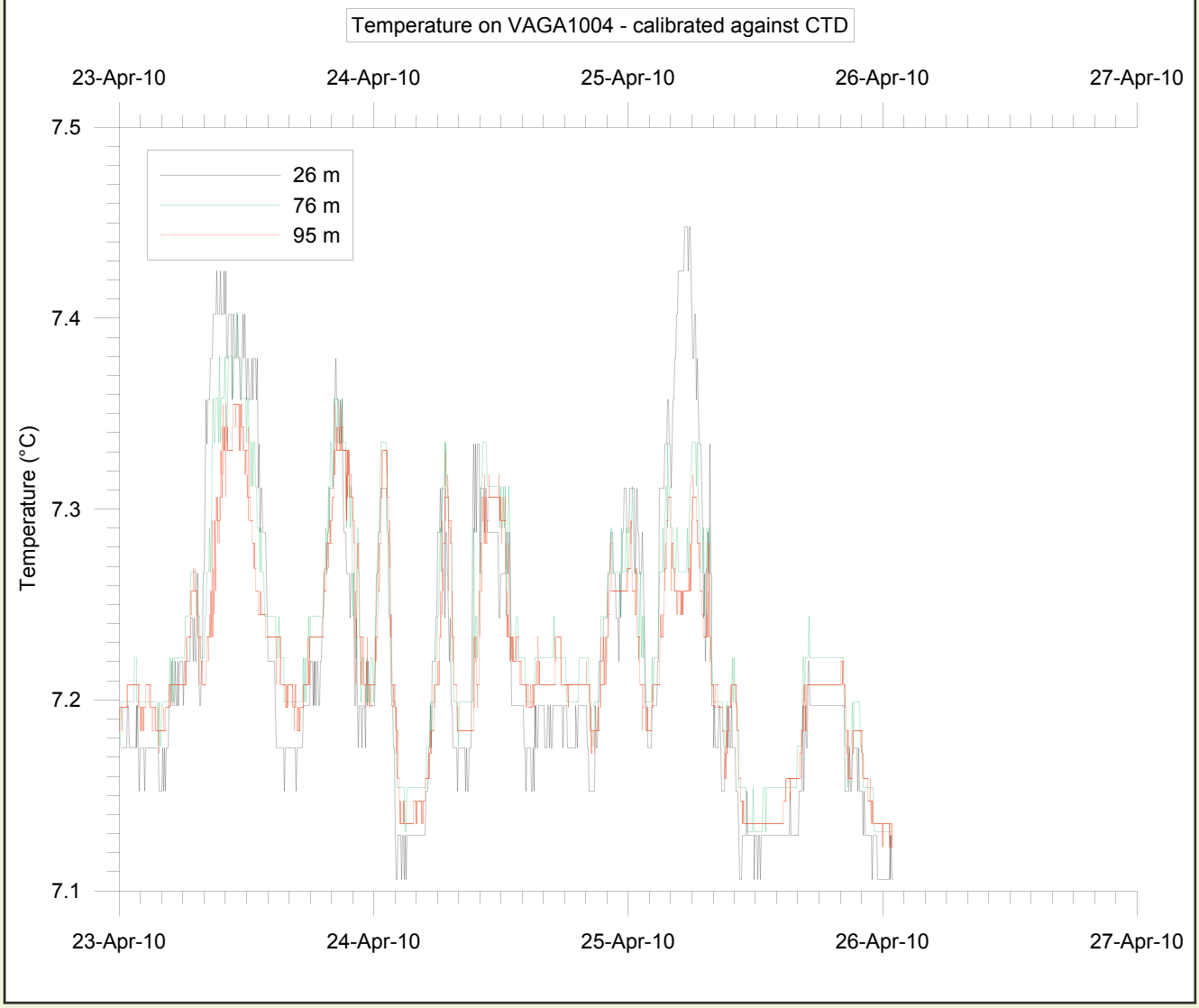

VAGA1004-076 Aanderaa 9741
Speed (mm/s)
1000
800
600
400
200
0
Direction (degr.)
360
270
180
90
0
East (mm/s)
600
400
200
0
-200
-400
-600
-800
North (mm/s)
1000
800
600
400
200
0
-200
-400
-600
23/4/10 6:32
23/4/10 18:32
24/4/10 6:32
24/4/10 18:32
25/4/10 6:32
25/4/10 18:32
26/4/10 6:32
26/4/10 18:32


VAGA1004-076 Aanderaa 9741
Temperature (degr. C)
7.50
7.40
7.30
7.20
7.10
Salinity (psu)
35.40
35.35
35.30
35.25
35.20
Pressure (dB)
50.0
45.0
40.0
35.0
30.0
25.0
20.0
23-Apr-10
23-Apr-10
24-Apr-10
24-Apr-10
25-Apr-10
25-Apr-10
26-Apr-10
26-Apr-10

VAGA1004-076 Aanderaa 9741

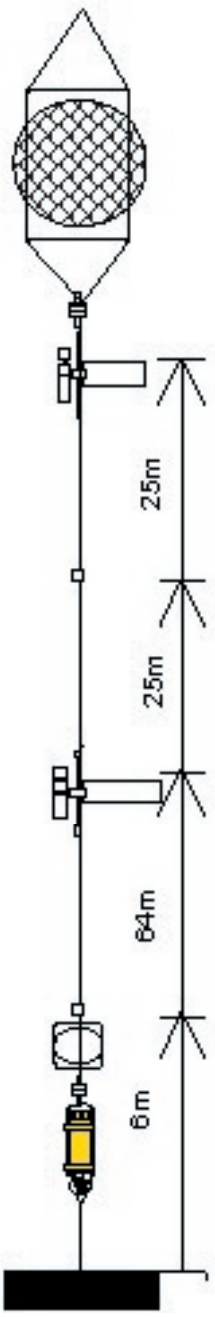


VAGA1004 All instruments



VAGB1004 data

Latitude: 61°50.000´N
Longitude: 007°34.800´W
Echo sounding depth: 140m
Bottom depth corr.: 143m
Time of deployment: 21/04 -2010 18:46UTC
Time of recovery: 26/04 - 2010 09:58UTC



Aanderaa (VAGB1004-023):

Instrument no.: RCM7 9742
Height above bottom: 120m
Depth: 23m (corr.)
Time of first data: 21/04 – 2010 18:52 UTC
Time of last data: 26/04 – 2010 09:52 UTC
Sample interval: 5 min
No. of records: 1333

Starmon (VAGB1004-048):

Instrument no.: 0656
Height above bottom: 95m
Depth: 48m (corr.)
Time of first data: 21/04 – 2010 18:52 UTC
Time of last data: 26/04 – 2010 09:52 UTC
Sample interval: 1 min
No. of records: 6661

Aanderaa (VAGB1004-073):

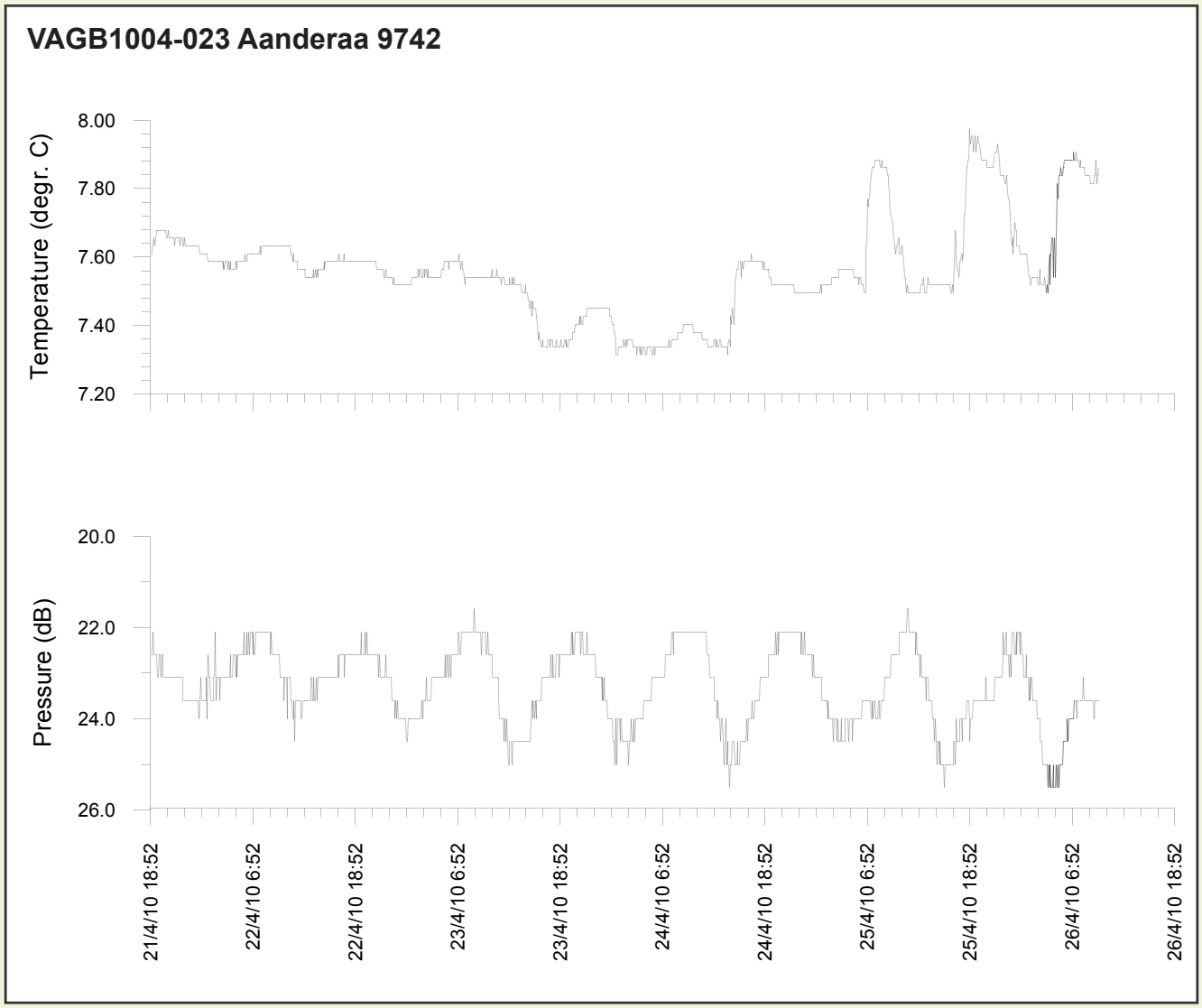
Instrument no.: RCM7 9758
Height above bottom: 70m
Depth: 73m (corr.)
Time of first data: 21/04 – 2010 18:52 UTC
Time of last data: 26/04 – 2010 09:52 UTC
Sample interval: 5 min
No. of records: 1333

Starmon (VAGB1004-137):

Instrument no.: 0657
Height above bottom: 6m
Depth: 137m (corr.)
Time of first data: 21/04 – 2010 18:52 UTC
Time of last data: 26/04 – 2010 09:52 UTC
Sample interval: 1 min
No. of records: 6661

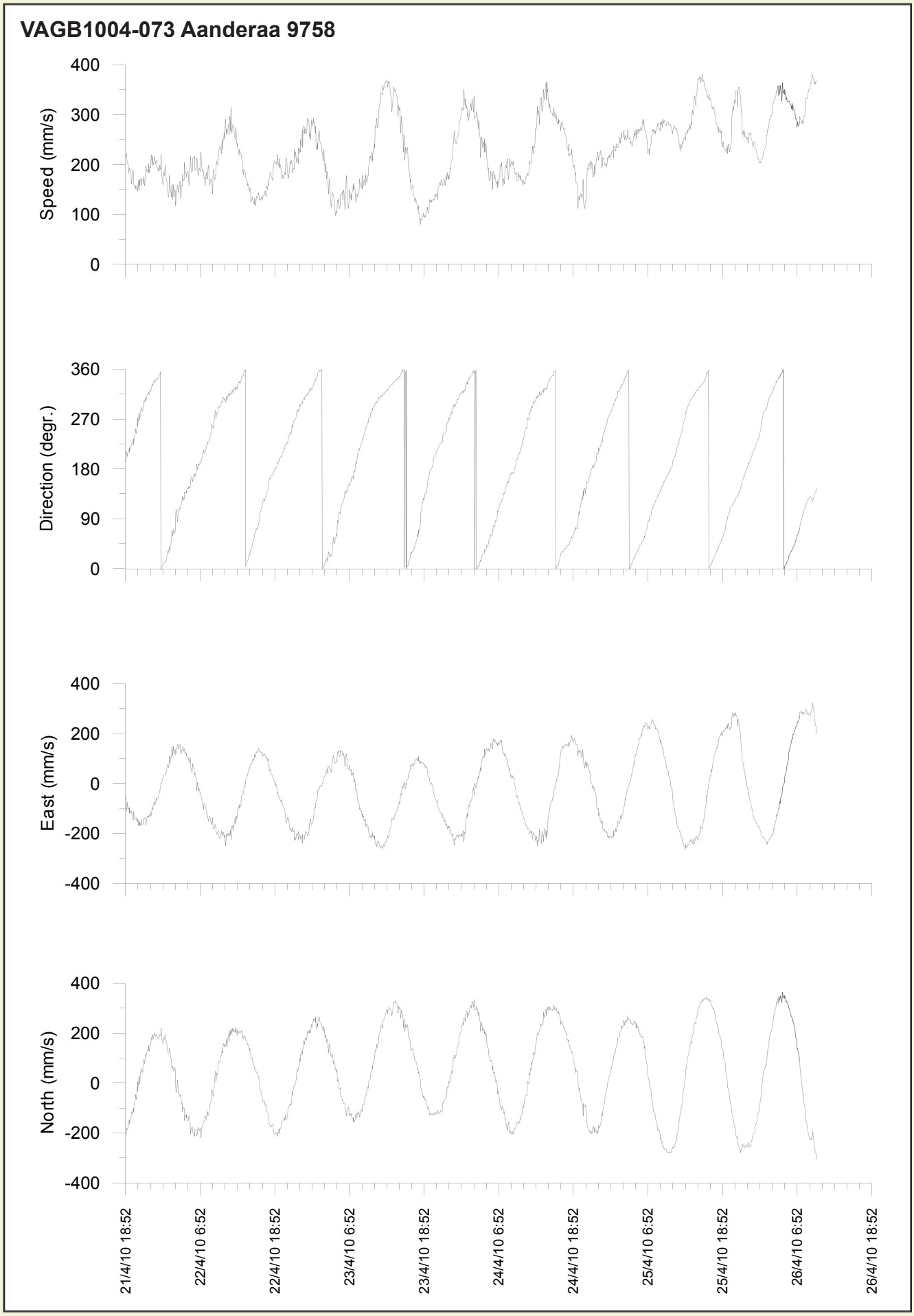
Data:

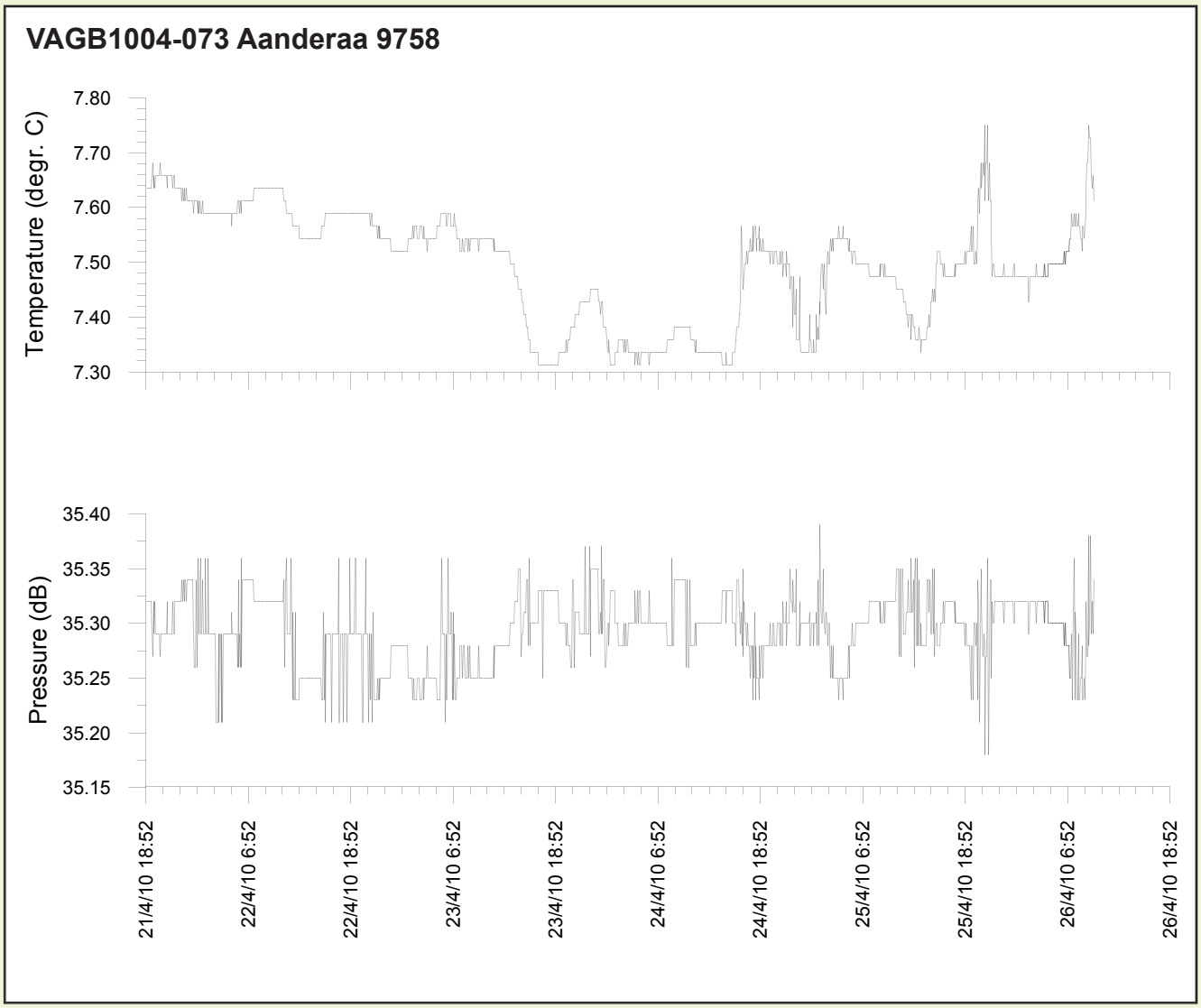
Ok, but the wing of the 9742 Aanderaa (023) was broken when recovered. Hence no velocity data in this file.


VAGB1004-023 Aanderaa 9742
Temperature (degr. C)
8.00
7.80
7.60
7.40
7.20
Pressure (dB)
20.0
22.0
24.0
26.0
21/4/10 18:52
22/4/10 6:52
22/4/10 18:52
23/4/10 6:52
23/4/10 18:52
24/4/10 6:52
24/4/10 18:52
25/4/10 6:52
25/4/10 18:52
26/4/10 6:52
26/4/10 18:52

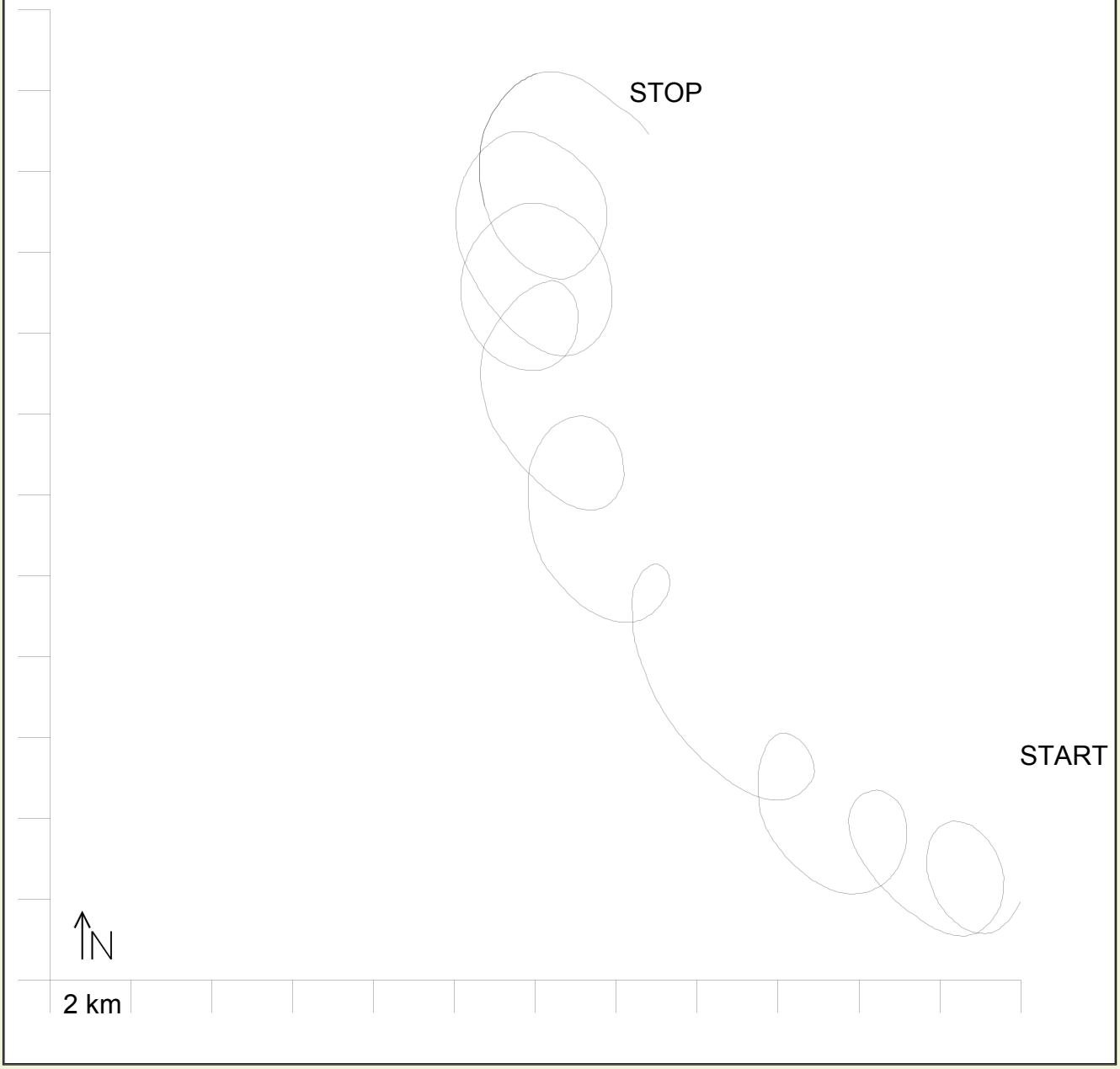
VAGB1004-073 Aanderaa 9758

```
Deployment: VAGB1004         analyzed from beginning to end
Instrument no.:  9758
Instrument type: Aanderaa
Latitude: 61 50.000 N
Longitude:07 34.800 W
Bottom depth:  143
Instrument depth:   73
Number of records: 1333
Time of first record: 2010 04 21 18 52
Time of last record : 2010 04 26 09 52
Time between records (min.):  5.000

Parameters            Records OK    Records flagged
----------            ----------    ---------------
Column  1   : Recno
Column  2- 4: Date
Column  5- 6: Time
Column  7   : Temp         1333               0
Column  8   : Speed        1333               0
Column  9   : Direct       1333               0
Column 10   : Salt         1333               0

Comments
--------


Residual current:  53 mm/sec towards: 334 degrees
----------------


TIDAL ANALYSIS
--------------
Error flagged records interpolated for velocity:     0, records not int.:     0
Tidal analysis on data passed through 3 filters: A12, A12, and A13
================================================================================
Const     Freq      E-ampl   E-gpl  N-ampl   N-gpl   Major   Minor    Incl   Grphl  R
          c/hr      mm/sec     deg  mm/sec     deg  mm/sec  mm/sec     deg     deg
--------------------------------------------------------------------------------
O1     .03873065        17     335      17     167      23       2     135     161  A  I
K1     .04178075        16     208      16      40      22       2     135      34  A
M2     .08051140       261     284     315     181     328     244     115     162  A
S2     .08333334        86     320     109     216     113      81     112     200  A  I
M4     .16102280         6     177       7     235       8       4      59     217  C


DIRECTIONAL CURRENT DISTRIBUTION (for all nonflagged observations in series)
-----------------------------
Relative number of observations in parts per thousand (ppt) grouped into speed and
direction intervals (of 30 degree width centred around the directions shown)
================================================================================
    Speed     |                    Direction intervals                    | All dir.
  intervals   |---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
   (mm/s)     | 15   45   75   105  135  165  195  225  255  285  315  345| Tot  Acc
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
    0 -   50  |   0    0    0    0    0    0    0    0    0    0    0    0|   0    0
   50 -  100  |   0    1    2    3    4    0    0    0    0    0    0    0|   9    9
  100 -  150  |   6   23   17   20   21   14   12    4    2    1    0    0| 117  126
  150 -  200  |  27   11   16    8   27   24   27   47   38   14    8   11| 258  384
  200 -  300  |  42   46   18   20   12   36   33   24   19   68   77   51| 445  829
  300 -  400  |  22    6    0    6   24    1    0    0    0    0   57   56| 171 1000
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----|---- ----
Total    (ppt)|  97   86   52   56   88   74   72   75   59   83  142  118|
Rel.flux (ppt)| 101   81   41   49   85   66   63   62   48   80  179  146|
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
Avg.spd (mm/s)| 240  217  184  199  221  204  200  189  187  221  289  285|
Max.spd (mm/s)| 351  322  296  333  382  306  277  272  254  293  377  380|
--------------|---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
```

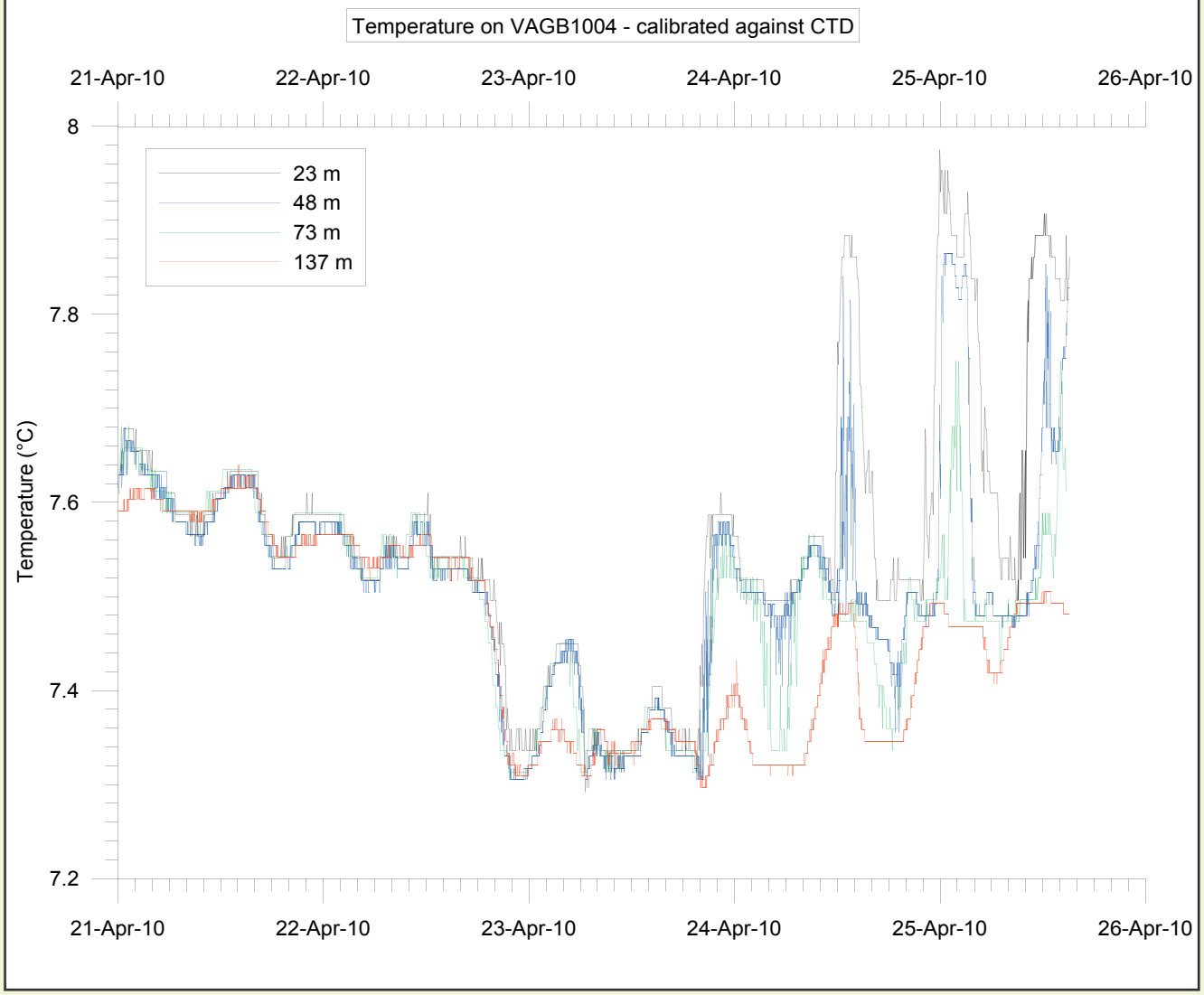

VAGB1004-073 Aanderaa 9758
Speed (mm/s)
400
300
200
100
0
Direction (degr.)
360
270
180
90
0
East (mm/s)
400
200
0
-200
-400
North (mm/s)
400
200
0
-200
-400
21/4/10 18:52
22/4/10 6:52
22/4/10 18:52
23/4/10 6:52
23/4/10 18:52
24/4/10 6:52
24/4/10 18:52
25/4/10 6:52
25/4/10 18:52
26/4/10 6:52
26/4/10 18:52


VAGB1004-073 Aanderaa 9758
Temperature (degr. C)
7.80
7.70
7.60
7.50
7.40
7.30
Pressure (dB)
35.40
35.35
35.30
35.25
35.20
35.15
21/4/10 18:52
22/4/10 6:52
22/4/10 18:52
23/4/10 6:52
23/4/10 18:52
24/4/10 6:52
24/4/10 18:52
25/4/10 6:52
25/4/10 18:52
26/4/10 6:52
26/4/10 18:52

VAGB1004-073 Aanderaa 9758



VAGB1004 All instruments



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