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MOORED CURRENT METER AND CTD OBSERVATIONS FROM BARROW STRAIT, 2002-2003

by

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Abstract

Pettipas, R., J. Hamilton, and S. Prinsenberg. 2006. Moored current meter and CTD observations from Barrow Strait, 2002-2003. Can. Data Rep. Hydrogr. Ocean Sci. 167 : v + 118 p.

Ten instrumented moorings deployed in the eastern end of Barrow Strait from August 2002 to August 2003 provide yearlong records of current, ice drift, temperature and salinity that extend a data time series started in August of 1998. Current data collected with Acoustic Doppler Current Profilers and specialised instrumentation for near-pole direction measurement, are presented as contour plots of both bihourly and low-pass filtered observations. Results of a tidal analysis of the current data are also presented. Temperatures, salinities and densities obtained from moored CTDs are displayed as time series plots for both hourly and low-pass filtered data, and as power spectra. Statistical results include means, extrema and standard deviations of all measured parameters.

Résumé

Pettipas, R., J. Hamilton, and S. Prinsenberg. 2006. Moored current meter and CTD observations from Barrow Strait, 2002-2003. Can. Data Rep. Hydrogr. Ocean Sci. 167 : v + 118 p.

Entre août 2002 et août 2003, une batterie de dix stations instrumentales ancrées dans l'embouchure est du détroit de Barrow a enregistré des données sur le courant, la dérive de la glace, et la température et la salinité de l'eau. Ces douze mois de données prolongent une série analogue débutée en août 1998. Nous présentons les cartes de contour des observations prises à toutes les deux heures par des profileurs de courant à effet Doppler et des instruments spécialisés pour la mesure des directions près du pôle. Nous présentons également des cartes de contour de ces mêmes données après leur lissage. Nous faisons l'analyse de marée des données sur le courant. Nous présentons les graphiques des données aux deux heures et des données lissées de la température, de la salinité et de la densité, mesurées avec les sondes CTP ancrées, ainsi que leur spectre de fréquence. Nous donnons les résultats statistiques suivants : les moyennes, les extrêmes et les écarts-types de tous les paramètres mesurés.

Introduction

A field program to quantify and examine the inter-annual variability of the exchange through Barrow Strait (a principal pathway between the Arctic and North Atlantic Oceans), and more generally, to improve our understanding of the circulation within the Arctic Archipelago, was started by BIO investigators in August of 1998. Data from the first 4 years of this study, along with a description of the methods used, have previously been reported [Pettipas et al., 2005; Hamilton et al., 2004, 2003, 2002]. Described here are moored instrument data from the fifth year of the study.

Yearlong records of current rate and direction, ice drift, temperature, salinity and density from Barrow Strait are presented as unfiltered and low-pass filtered time series plots along with relevant statistical summaries for each season. CTD data are also presented as power spectra. Results of tidal analyses give tidal amplitudes, phase and ellipse orientation as a function of depth for each of the 5 main tidal constituents (K1, M2, O1, S2, P1). Separate tidal analyses have been done for periods of solid ice cover and periods of open water.

Finally, hydrographic sections at the eastern and end of Barrow Strait, and across Wellington Channel are presented. These cross-sectional diagrams are created from a CTD survey conducted during the field study.

Mooring Locations and Description

A total of 10 instrumented moorings were distributed over 4 sites across the eastern end of Barrow Strait (see Figure 1). Four moorings were located at the 150 m contour on the south side, 2 moorings were halfway between this Southern site and the center of the strait (the “South Central” site), 2 moorings were in the middle of the Strait (the Central site), and 2 moorings were at the 200 m contour on the north side. An illustration of the moorings deployed is shown in Figure 2. The mooring distribution is similar to that of the previous year, when the array was expanded from the original 2

sites; the 200 m contour on the Southern and Northern sides. This year, a moored profiler was added at the Southern site to obtain water property information in the upper water column. Previously, salinity and temperature information above 30 m has been unattainable because of the risk of loss due to ice ridges and icebergs with conventional mooring technology. The new profiler, called Icycler, consists of a main float set at 50 m depth, which houses a winch that pays out and reels in a sensor float once a day. The sensor float is equipped with a sonar to detect the under-ice edge, and triggers the termination of the profile once the sensor float has ascended to within 2 meters of the ice. Icycler was developed at Bedford Institute of Oceanography, and is described in Fowler et al., 2004.

Acoustic Doppler Current Profilers (ADCPs) manufactured by RD Instruments (RDI), and precision heading references were mounted in streamlined buoyancy packages to provide current rate and direction information. The technique used to obtain reliable direction measurements here, where conventional compass technology is inadequate due to the proximity of the site to the magnetic pole, is described in detail by Hamilton [2001]. These upward looking ADCPs logged average speeds from 100 pings over a 5 minute on-period every 2 hours, and also provided a simultaneous ice drift speed over the yearlong deployment. Concurrent direction measurements were logged separately with the precision heading reference system, and have been merged with the ADCP speed data for presentation here. All 5 ADCP/compass systems were successfully recovered, and with the exception of one of the compass systems, provided good quality data for the entire deployment period. The compass in the ADCP/compass system moored at 80 m depth at the Southern site failed after 2 months operation. Directions for this record after the failure have been derived from measurements made with the deep, nearby (0.6 km) ADCP/pole compass system, since the current measurements should be the same over the depth interval where the 2 systems' ranges overlap.

SeaBird MicroCat CTDs were used to measure temperature, conductivity and pressure at targeted depths of 40, 80 and 160 m across the Strait, as well as the near-bottom at the Southern and South-Central sites. These CTDs recorded a single temperature, conductivity and pressure every hour. The top of one mooring along with upper level microcats (30 and 40 m) at the Southern site was lost presumably to ice. Data

from Icycler provided redundancy for this loss and is presented here as the 40 m level data at the Southern Site. A set-up error limited the Icycler profile to just a 5 m interval over the 44 to 39 m depth range. No data were provided by the near-bottom microcat at the South-Central site due to instrument malfunction.

Post-deployment calibration revealed good stability over the yearlong deployment for the recovered CTDs.

Data Processing

Current Speed and Direction Data

The ADCPs were mounted in streamlined buoyancy packages (A2 "SUBs" manufactured by Open Seas Inc.) and set up to measure current relative to the instrument axes, ignoring their own compass information. Instruments were set up to average over a depth interval of 4 m. Typically, the highest useful depth average in the data sets from the 4 upper ADCP instruments was centered around 10 m. Current data above this level were rejected based on RDI's standard echo intensity quality criterion. These acoustic Doppler current profilers also record ice drift velocity when there is solid or near-solid ice cover.

Direction was provided using an independent compass package mounted in the A2 tail to give the orientation of the ADCP relative to magnetic north. Initiation of a compass sample cycle was triggered by the commencement of the bihourly ADCP measurement by making use of RDI's "RDS3 interface" to provide a turn-on pulse to the compass. The compass was programmed to take a 20 s sample in the middle of the 5 minute ADCP sampling interval. This conserved compass battery power, and took advantage of previous experience that current direction does not change significantly over 5 minutes at the study location [Hamilton et al., 2003].

Direction records were then adjusted for the variation in magnetic declination using magnetic observatory data from the NRCAN observatory in Resolute to get direction relative to true north.

Vertical excursions of the ADCPs caused by current drag forces acting on the mooring were small. For the four ADCP/pole compass systems moored at the targeted 80 m depth, the largest standard deviation in the depth over the year was 0.83 m for the ADCP mooring at the south-central site, with the bulk of the variance accounted for by tidal height variation. Mooring dip was greater than 3 m less than 1% of the time, with the maximum observed being 9 m. Corrections for mooring dip have been applied where necessary using depth information from the moored CTDs, so that reported current speeds are at the correct absolute depth.

Moored CTD Data

SeaBird MicroCat CTDs were set up to measure temperature, conductivity and pressure every hour for the yearlong deployments. Moorings supporting the upper CTDs were subjected to the greatest dip due to current drag forces acting on the mooring. The greatest dip was again seen at the south-central site with an observed maximum of 12 m. For this CTD the standard deviation in instrument depth over the yearlong deployment was 0.8 m, with tidal height variation accounting for about 1/3 of this variation.

Low-Pass Filtering

Some of the data series presented have been filtered to remove the semidiurnal and diurnal tides using the technique described by Godin (1972). The technique uses three simple averaging filters applied in sequence. Godin, working with hourly observations, recommends two consecutive applications of a filter that averages over 24 samples, followed by one that averages over 25 samples. Here, the hourly MicroCat CTD data have been decimated to match the bihourly sampling of currents, and averaging filters of 12 and 13 samples are then applied to all the data sets.

Tidal Analysis

Harmonic tidal analyses of current data using Foreman's (1978) method is presented separately for periods of solid ice cover, and periods of broken or no ice, for each site where sufficient data for analysis are available. Ice was typically more mobile in 2002-2003 than observed in previous years of the study. In fact, at the North and Central sites the period of solid, land-fast ice was less than 4 weeks; too short a time series to allow for our tidal analyses. For all other cases, the tidal ellipse axes amplitudes, orientations and phases for the main tidal constituents (K1, M2, O1, P1 and S2) are plotted as a function of depth.

The periodic vector function describing a particular constituent, traces an ellipse over a tidal cycle with major and minor amplitudes defined by the length of the semi-major and semi-minor axes. The major axis amplitude is always positive. The sign of the minor axis amplitude defines the rotation sense of the current ellipse. When positive the vector traces the ellipse in a counter-clockwise direction; when negative, the rotation sense is clockwise.

Ellipse orientation is the angle measured counter-clockwise from east to the semi-major axis.

The phase is a measure of the timing of high water referenced to astronomic positions over the Greenwich meridian. Phase is measured counter-clockwise from this chosen reference.

Data Presentation

Yearlong time series of hourly temperature, salinity and density from the moored CTDs are shown in Figures 3 - 6. For the 40 m level at the Southern site, only daily values are shown (collected with the Icycler profiler), since the upper level microcat CTD at this site was lost. The freshening of the upper level that occurs in late summer and into the fall is more pronounced at the South-Central and Central sites than in the previous year [Pettipas et al., 2005], with minimum 40 m salinity values 0.5 and 1 ppt fresher respectively. The duration of this fresh water pulse is also several weeks longer.

Power spectra of the moored CTD measurements are shown in Figures 7-10. Results are similar to the previous year with one exception being 4 times the variance in the mid-depth salinity and density in the diurnal band at the South-Central site.

Diurnal and weaker semi-diurnal signals are typically observed in the records, except at the Central site where, as in the previous year, the spectra show little in the way of distinguishing features.

Current data are shown as contour plots in Figures 11-18. Data from the deep and mid-water ADCPs at the Southern site have been combined. Data are presented in along-strait and cross-strait components, where positive values are defined as flow towards 105° true and 15° true, respectively. Figures 11-14 display a month of unsmoothed data in which a strong tidal signal is apparent. Low-pass filtered data (tides removed) are shown in Figures 15-18. Mean flow is predominantly eastward at the South and South-central sites throughout the year. At the central site mean flows are near zero until winter, but eastward in late winter and early spring. At the Northern site, flow direction is westward in late summer and fall, and then near zero or weakly eastward for the rest of the year.

Missing data near the surface through the winter and spring (Figures 15-18) are caused by a decrease in the effective range of the ADCPs when the water is at its clearest, and contains a minimum of acoustic reflectors. (The manufacturer's suggested data quality acceptance criteria have been applied.) The smoothing method used has smeared the impact of missing raw data over the filter length.

Smoothed temperature, salinity and current data (where available) are shown for each moored CTD level in Figures 19-31. Tables 1 through 24 provide a summary of the CTD and ADCP data at the CTD depths, with statistics computed over each season, and for the entire year. Density has been included in these statistical summaries.

A fall freshening at the 40 m level salinity is apparent right across the strait this year compared to 2001-2002, when there was little evidence of it at the South-Central and Central sites. Yearlong averaged CTD values though are similar to the previous year.

Annual and seasonal mean flows are summarised in Figures 32-37. Each 4 m binned value from the ADCP is shown. The small discontinuity at the 75 m level in some

of the Southern site records is a result of merging records from 2 ADCPs separated by ½ km on different moorings.

Annual mean flows at the Southern and South-Central sites are 30-40% larger than in 2001-2002 (Figure 32). Currents during the fall at the South-Central site, when the freshening at the 40 m level is observed, are 70% larger than in the fall of the previous year, indicating an enhanced eastward freshwater flux compared to the previous year.

As in the previous year, the observed late summer and fall easterly flow in the upper water column is progressively lighter moving northward to the South Central and Central sites, and westward on the North side. In winter and spring, flow is eastward right across the strait, with flows noticeably enhanced at the Southern and South Central sites through spring and early summer .

The variance in the bihourly, and low-pass filtered current data for the yearlong ADCP records are shown in Figure 38. Results are similar to the previous year, although here, along-strait variance values are somewhat higher, particularly at the Southern site. On the south side, tides account for only half of the total variance in the along-strait current speeds, but at the Central site the portion due to tides is about 80%.

Tidal analysis results for the ADCP data collected at all 4 sites are presented as profiles for the 5 largest tidal constituents in figures 39 – 58. Separate analyses have been done for ice-free and solid ice periods. At 2 of the 4 sites, the solid ice period was too short to provide reliable results. Ellipse orientations are generally along-strait as expected. Tidal constants are summarised in Tables 25 - 29.

Ice velocities through the year at each of the 4 sites were derived from the upper ADCPs, and are shown in Figures 59 - 62. Since the ice drift measurement quality is degraded by the presence of open water, there are periods in the time series where no data are presented. The manufacturer's suggested data quality standards have been applied to the ice drift data. An additional criterion applied here is that where the magnitude of the "error velocity" for a particular ensemble is greater than 1 cm/s, the ice drift velocity estimate and the adjacent estimates are rejected.

This year was remarkable in that ice was mobile for most of the winter and spring at all sites. In 2001-2002, ice was solid and immobile for at least 5 months at all sites. In

2002-2003, the longest continuous period of no motion was 1 month at the Southern site.

A station map for the August 2003 ship-based CTD survey is shown in Figure 63. The western Barrow Strait line was not completed (the stations not done are indicated by open circles) because of the heavy ice conditions and time constraints. Results for the other 2 lines appear as contoured sections in Figures 64 and 65. At the Eastern Barrow Strait Line (Figure 64) geostrophic flow is eastward on the South side, and westward on the North side as in previous years

Acknowledgements

We thank Kumiko Azetsu-Scott and Don Belliveau for their reviews of this report, and Lorne McKee (NRCAN) for providing the Resolute Observatory magnetic declination data.

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Figure 1. **A map of the work area showing the location of the mooring sites (the open boxes), and the hydrographic survey lines (the dashed lines).**

Figure 2. Illustration of the instrumented moorings.

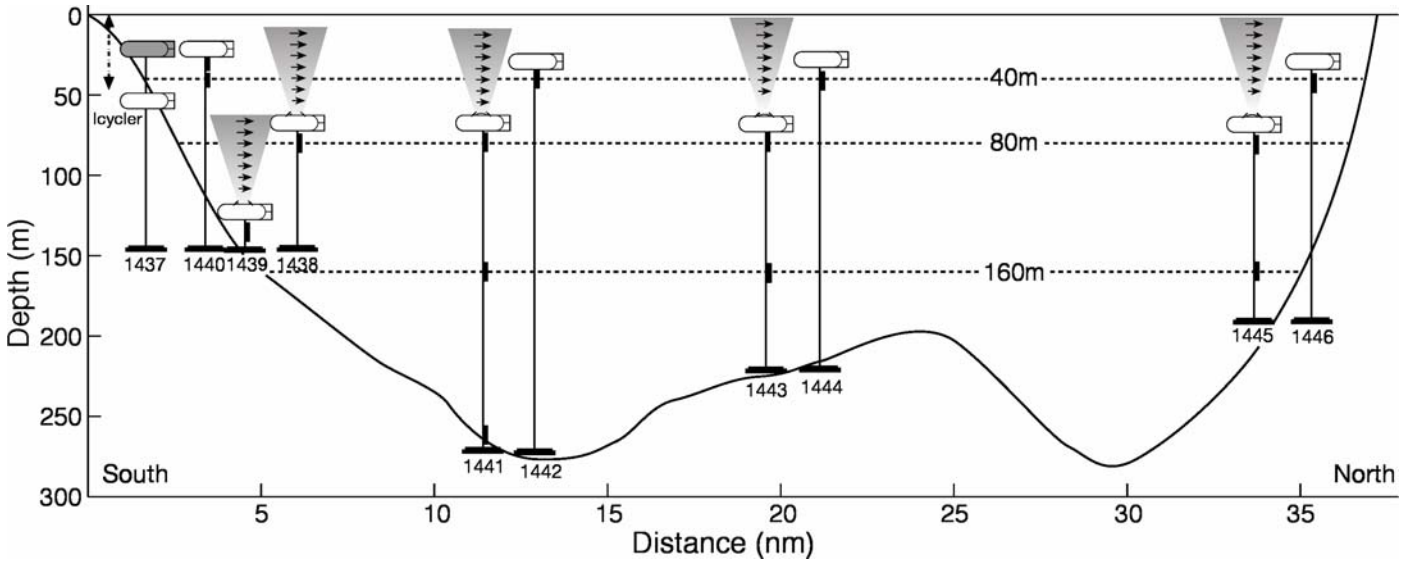


Figure 3 - **Moored hourly CTD data (79, 147 m.), daily Icycler data (40 m.)**
South Side Barrow Strait: August 2002 – August 2003

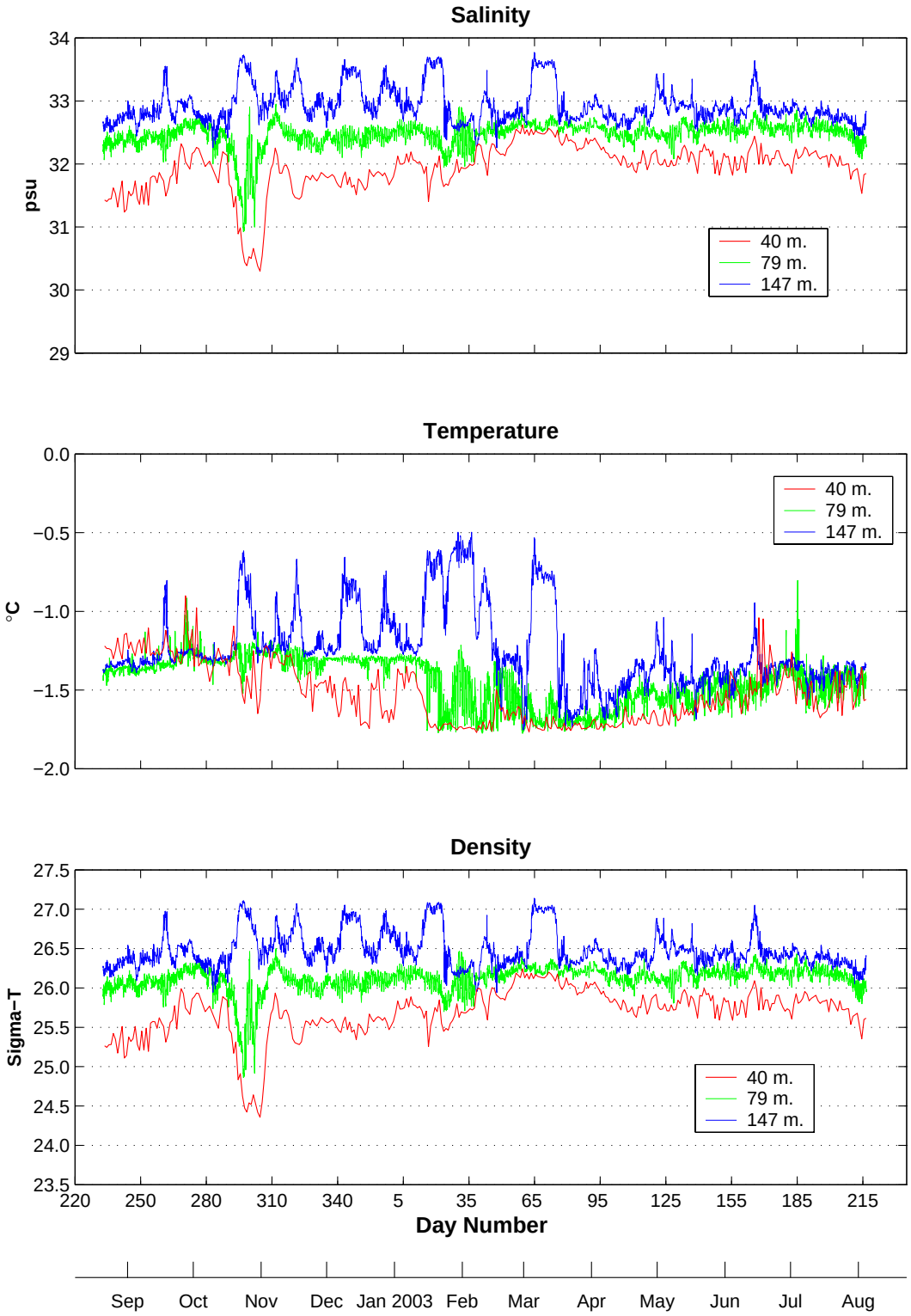


Figure 4 - Moored hourly CTD data, South Central Barrow Strait
August 2002 - August 2003

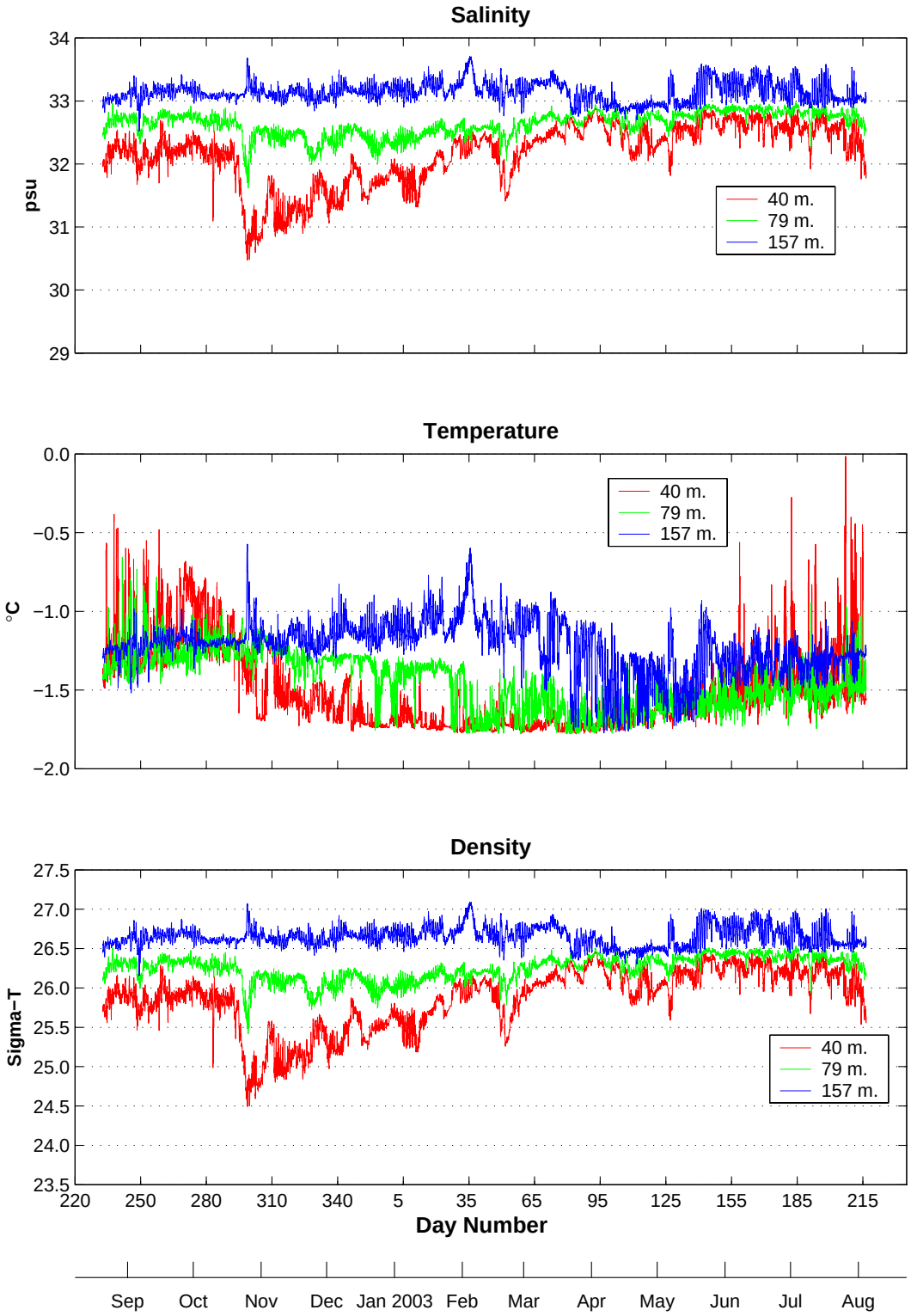


Figure 5 – Moored hourly CTD data, Central Barrow Strait: August 2002 - August 2003

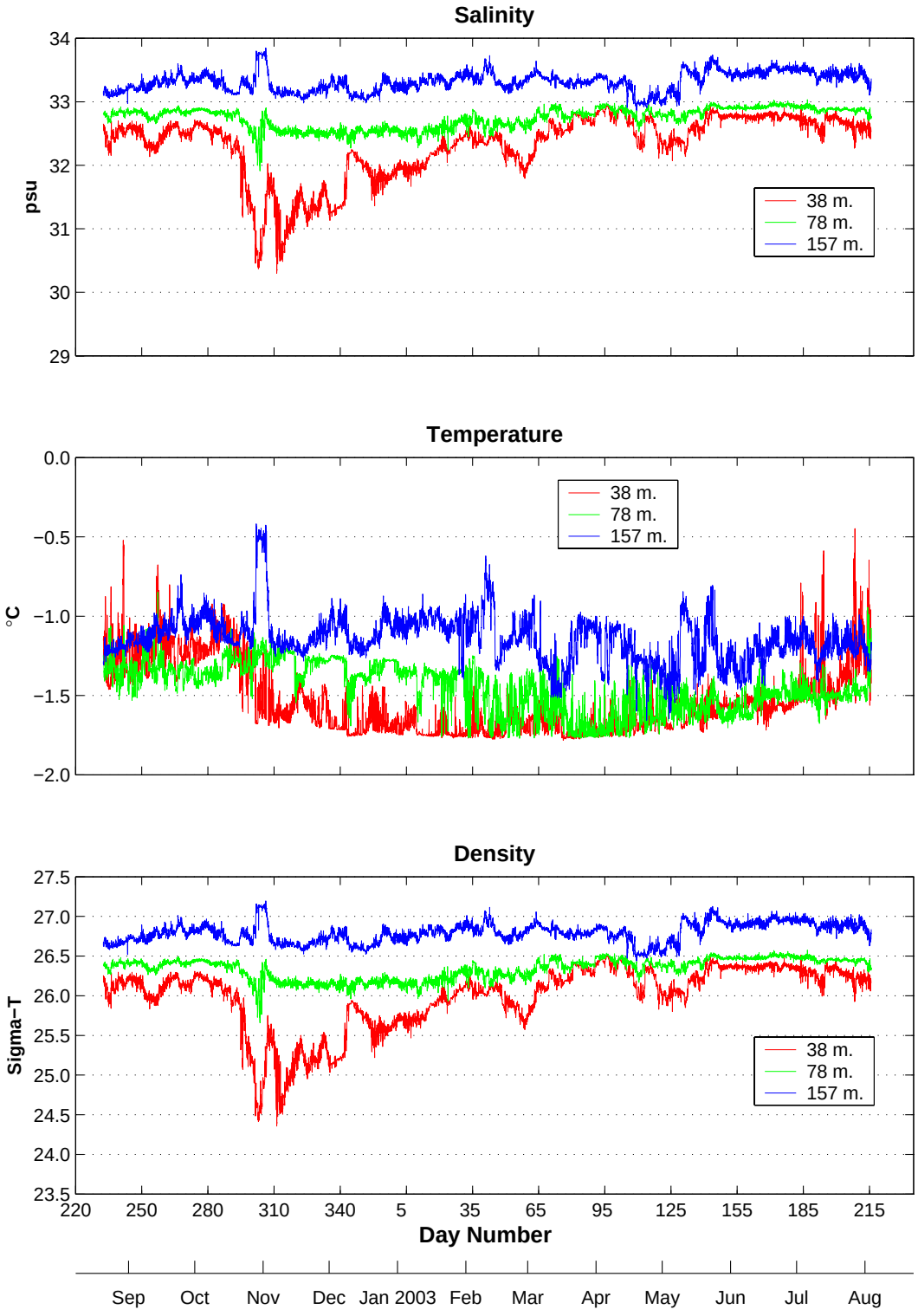


Figure 6 - Moored hourly CTD data, North Side Barrow Strait: August 2002 - August 2003

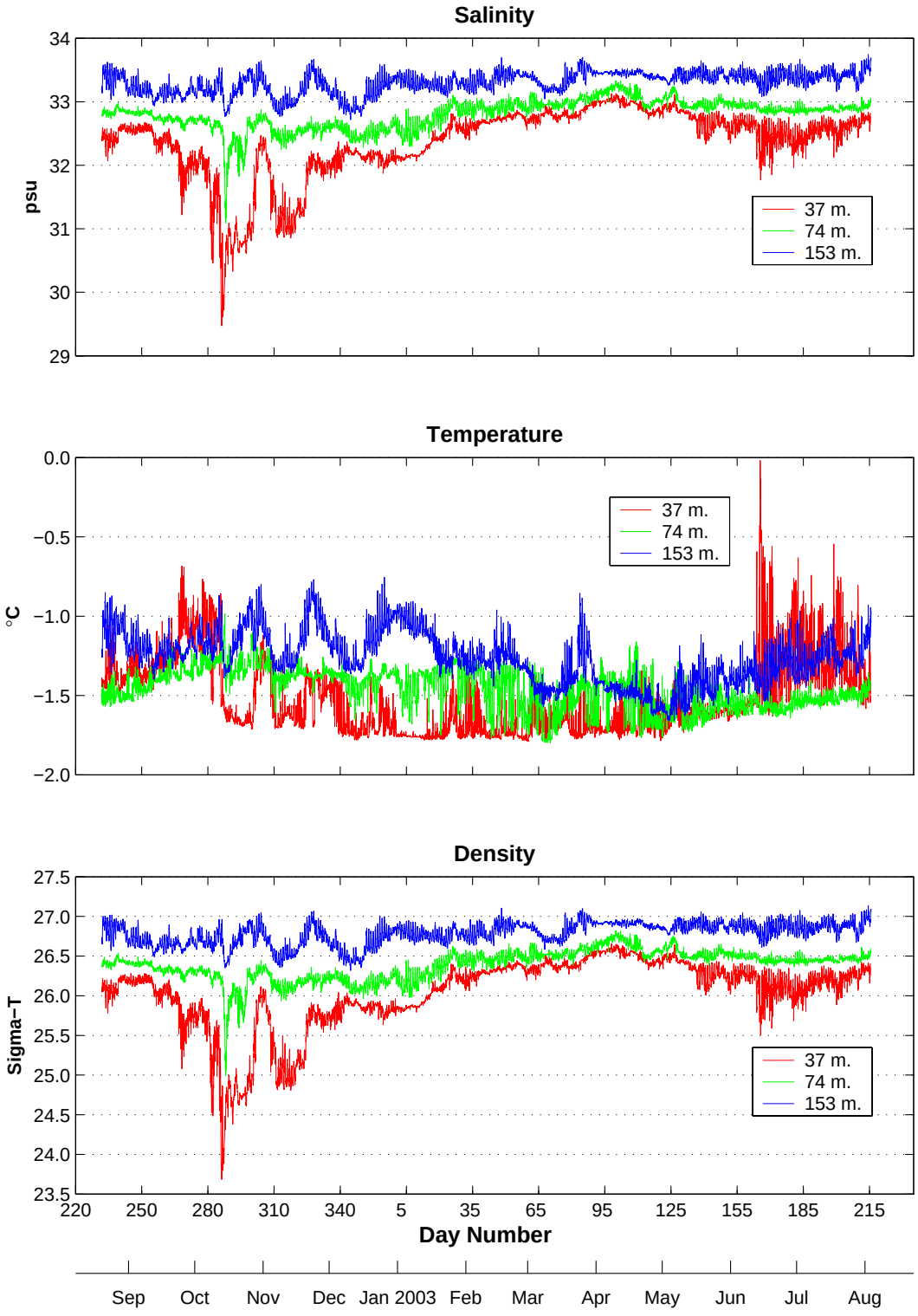


Figure 7 – Power Spectra of moored bi-hourly CTD data, South Side Barrow Strait: Aug. 2002 – Aug. 2003.

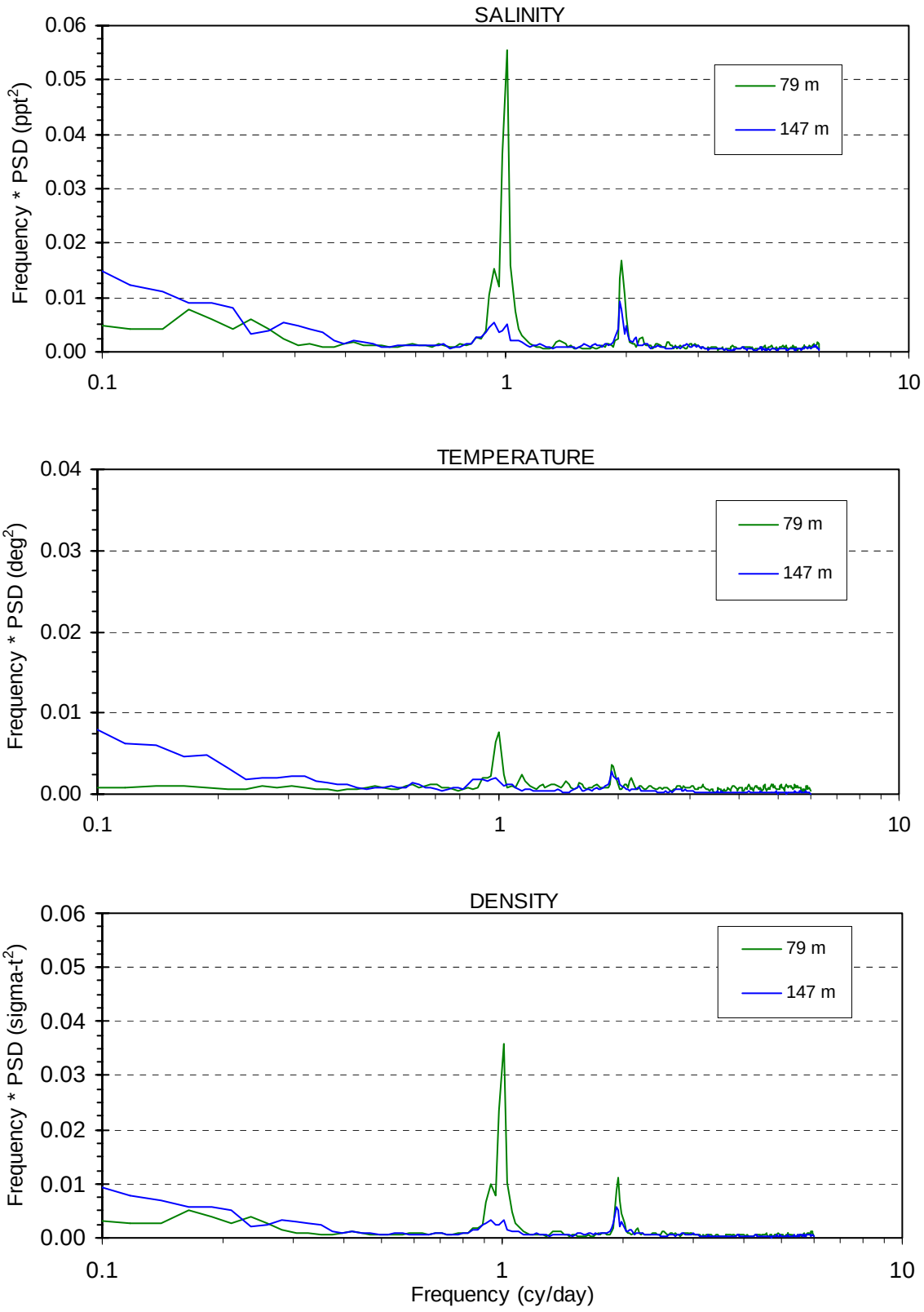


Figure 8 – Power Spectra of moored bi-hourly CTD data, South Central Barrow Strait: Aug. 2002 – Aug. 2003.

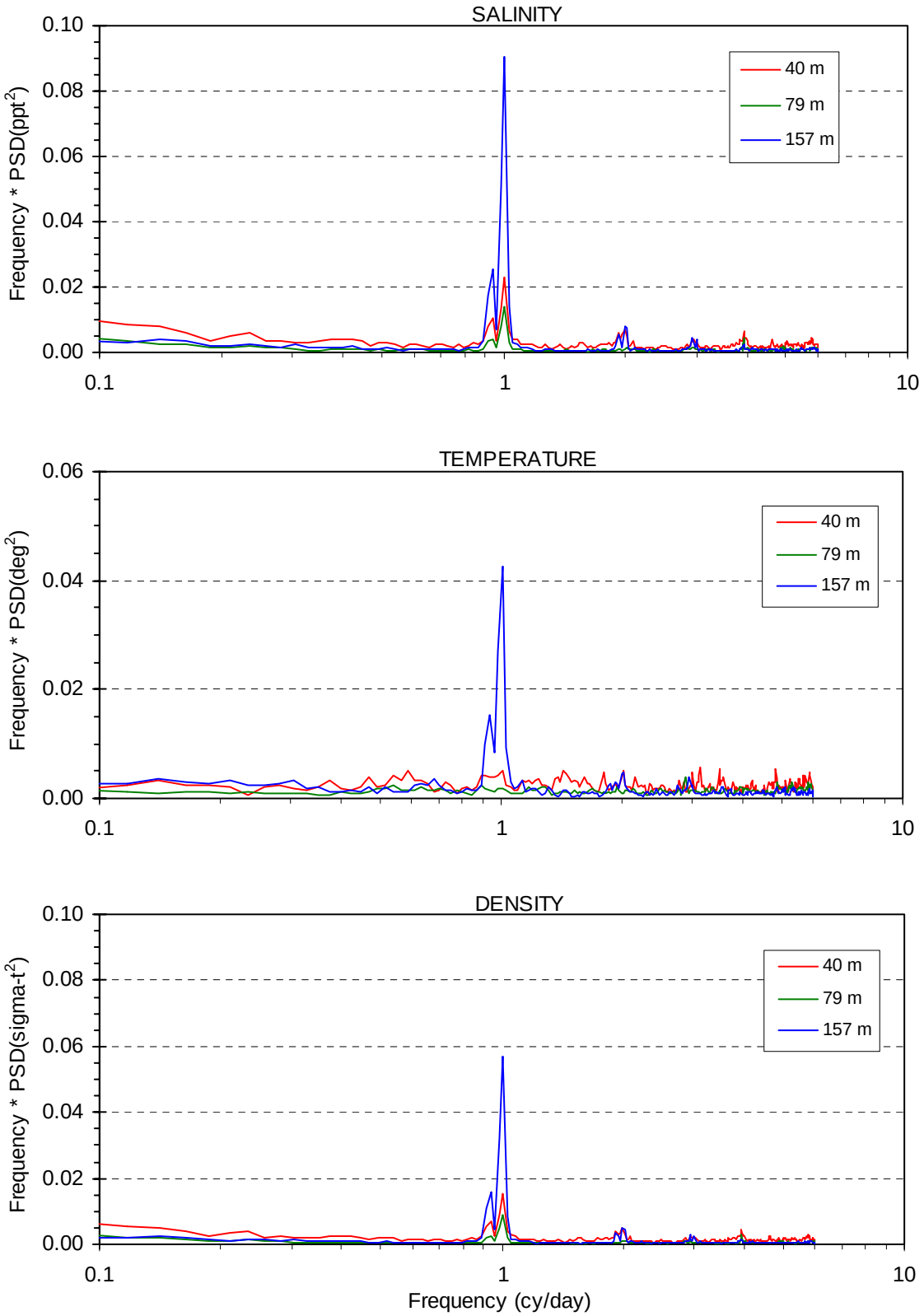


Figure 9 – Power Spectra of moored bi-hourly CTD data, Central Barrow Strait: Aug. 2002 – Aug. 2003.

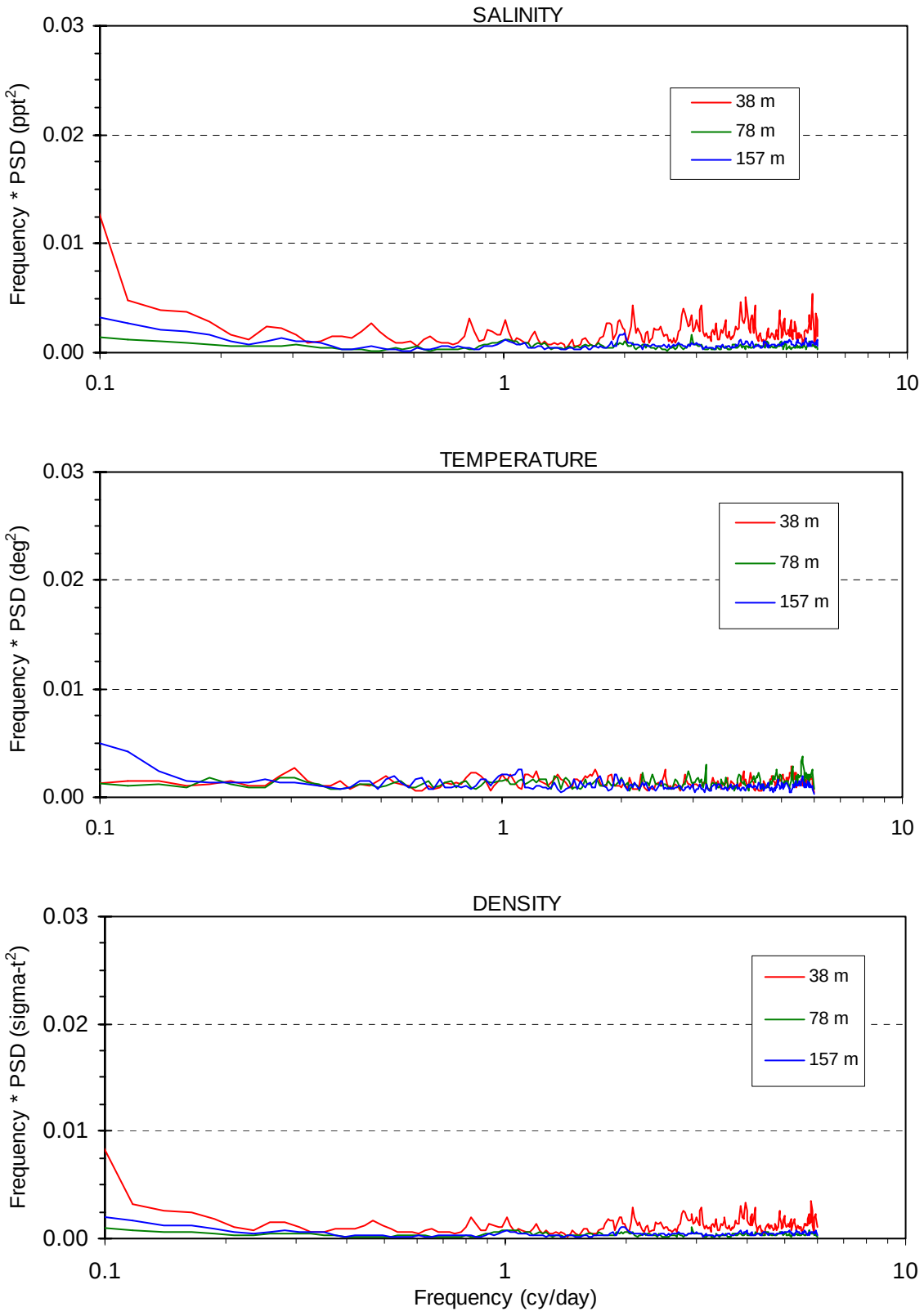


Figure 10 – Power Spectra of moored bi-hourly CTD data, North Side Barrow Strait: Aug. 2002 – Aug. 2003.

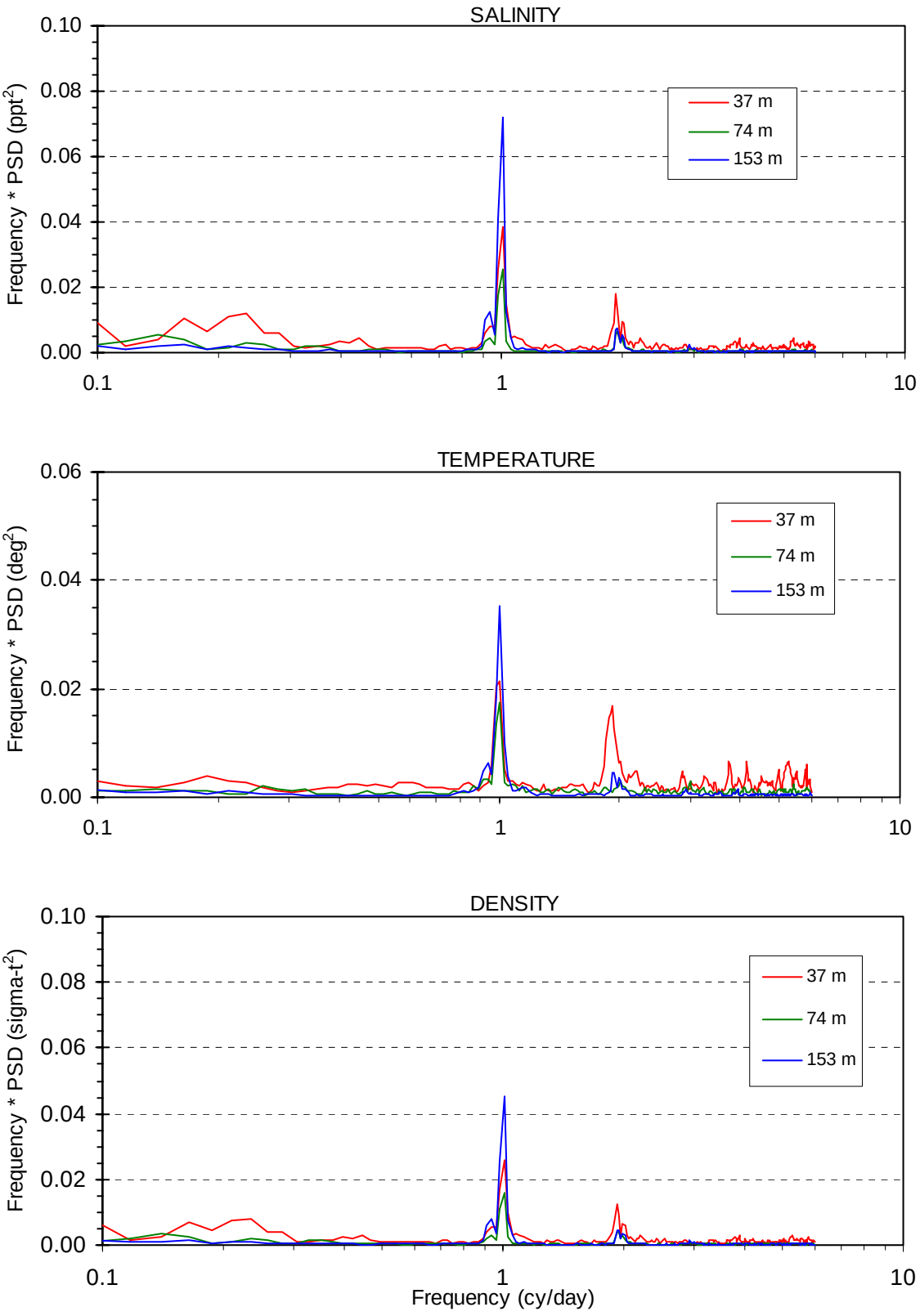
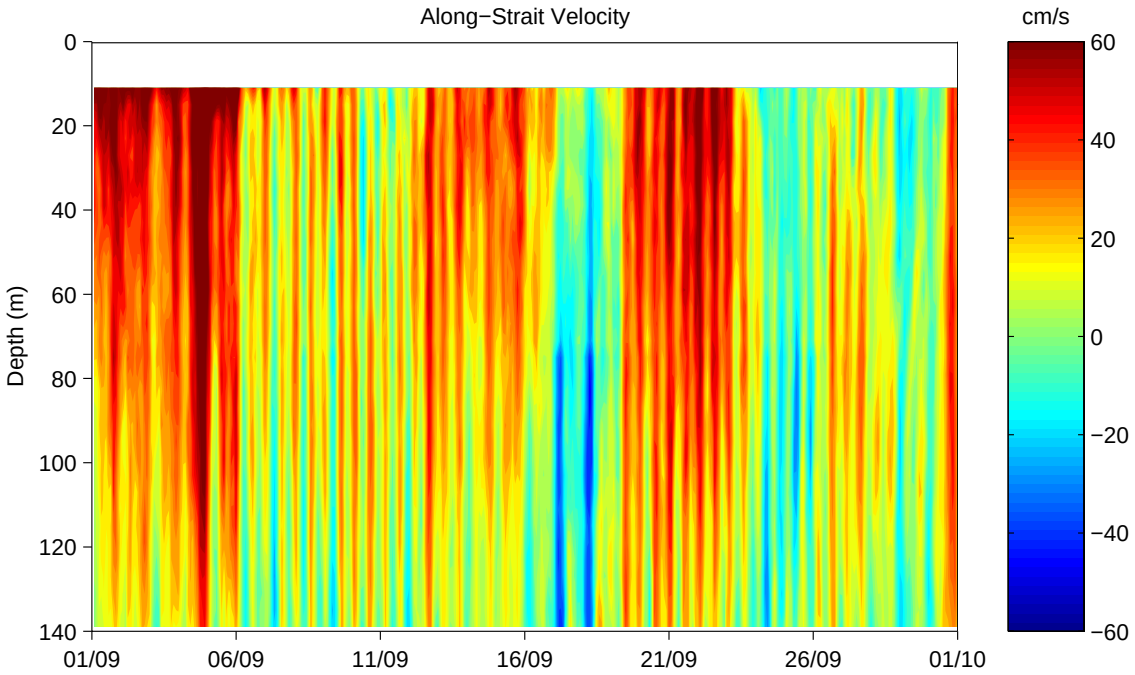


Figure 11 - Bihourly current data, South Side Barrow Strait
Sep. 1, 2002 – Sep. 30, 2002



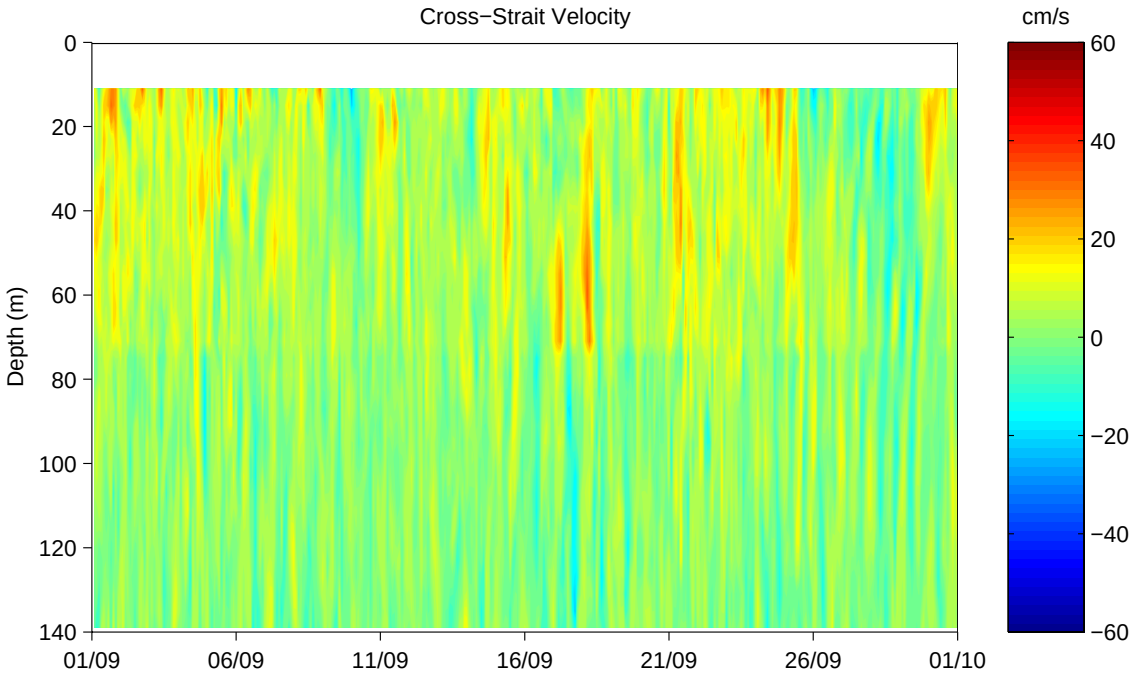
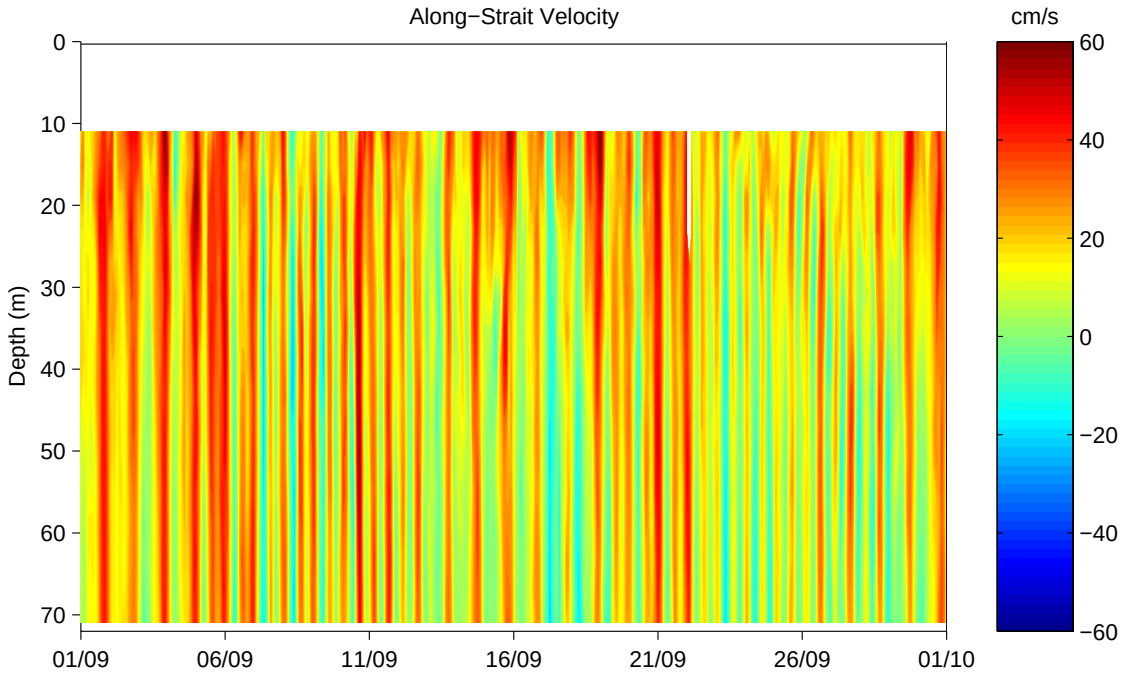


Figure 12 - Bihourly current data, South Central Barrow Strait
Sep. 1, 2002 – Sep. 30, 2002



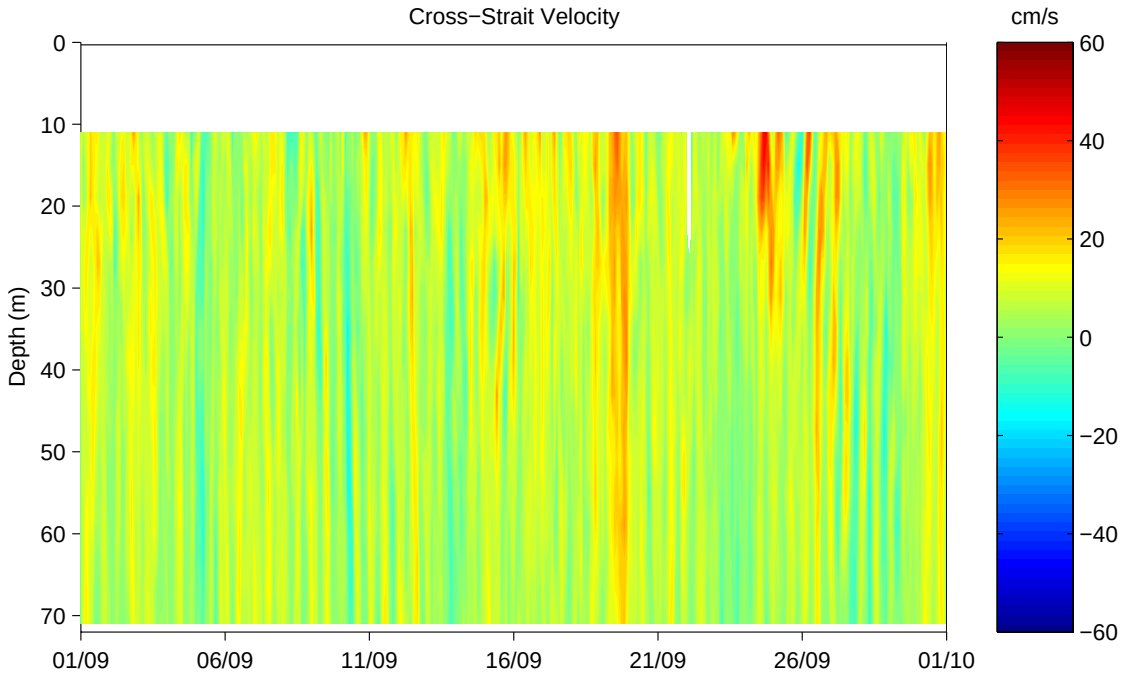


Figure 13 - Bihourly current data, Central Barrow Strait
Sep. 1, 2002 – Sep. 30, 2002

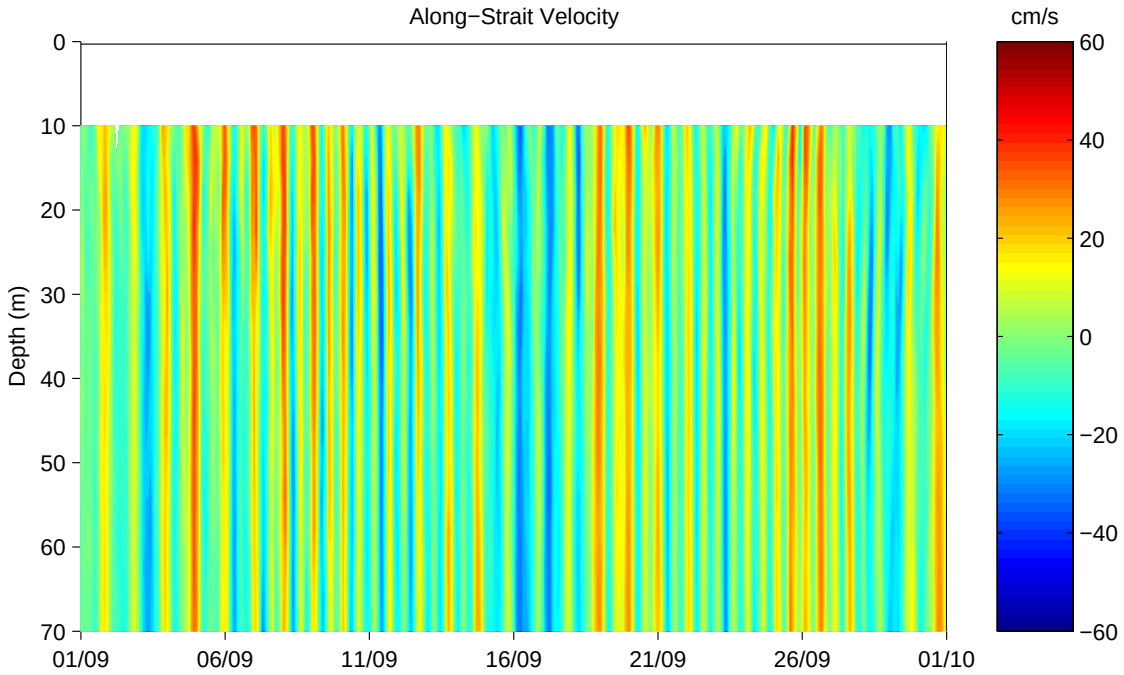
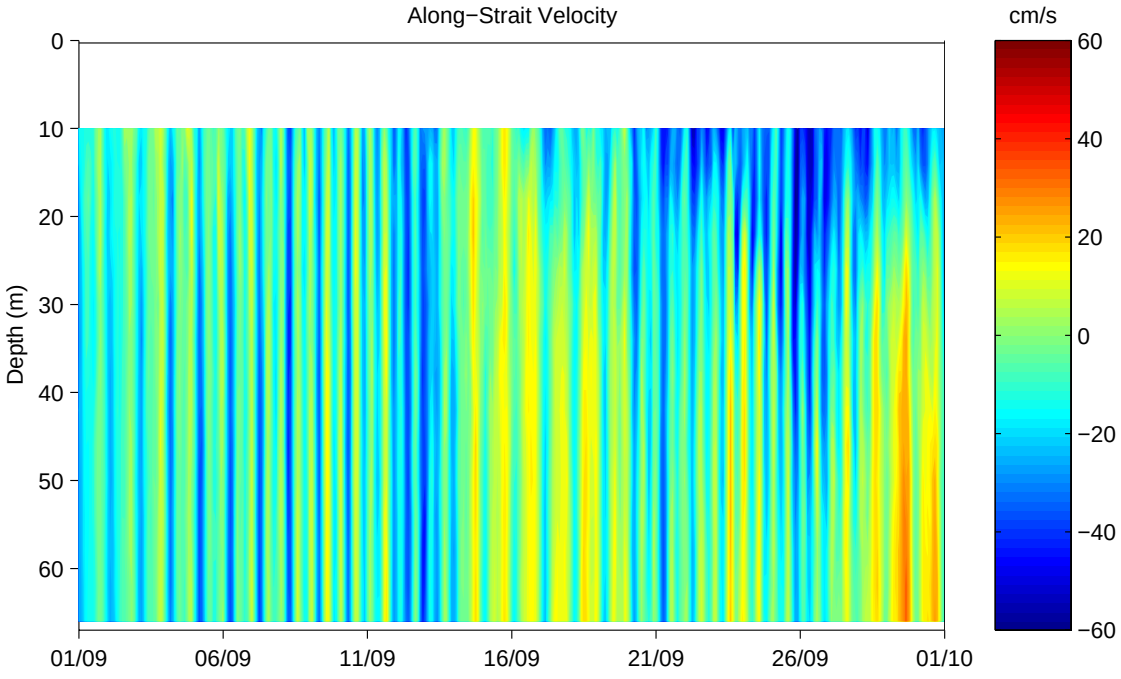
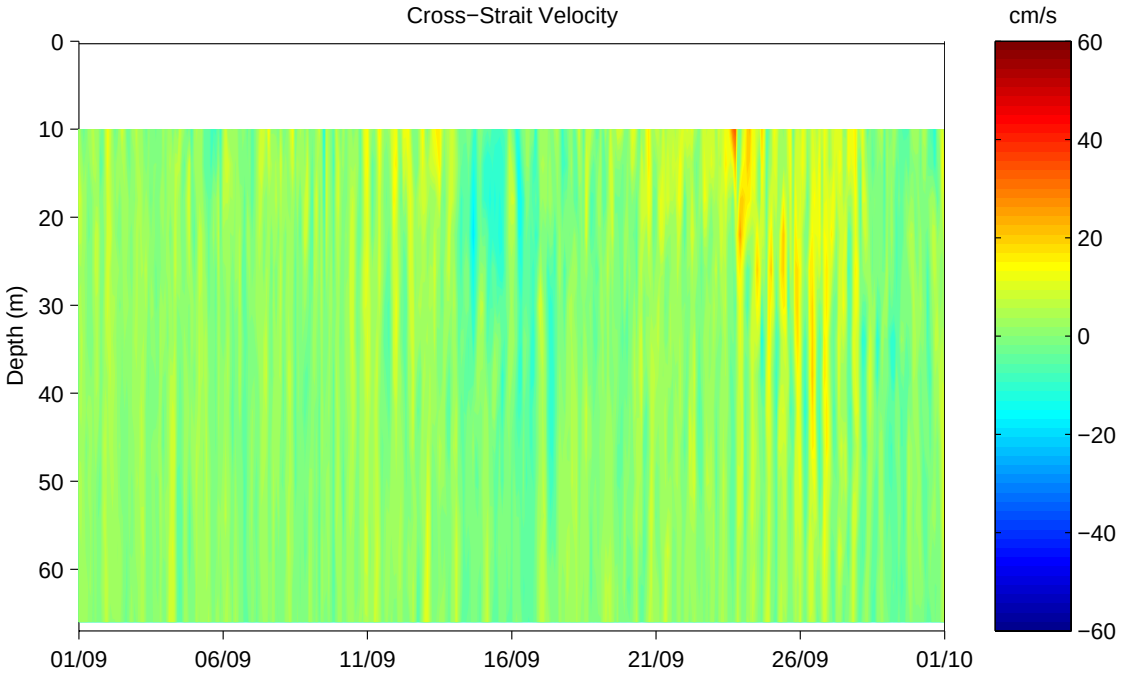
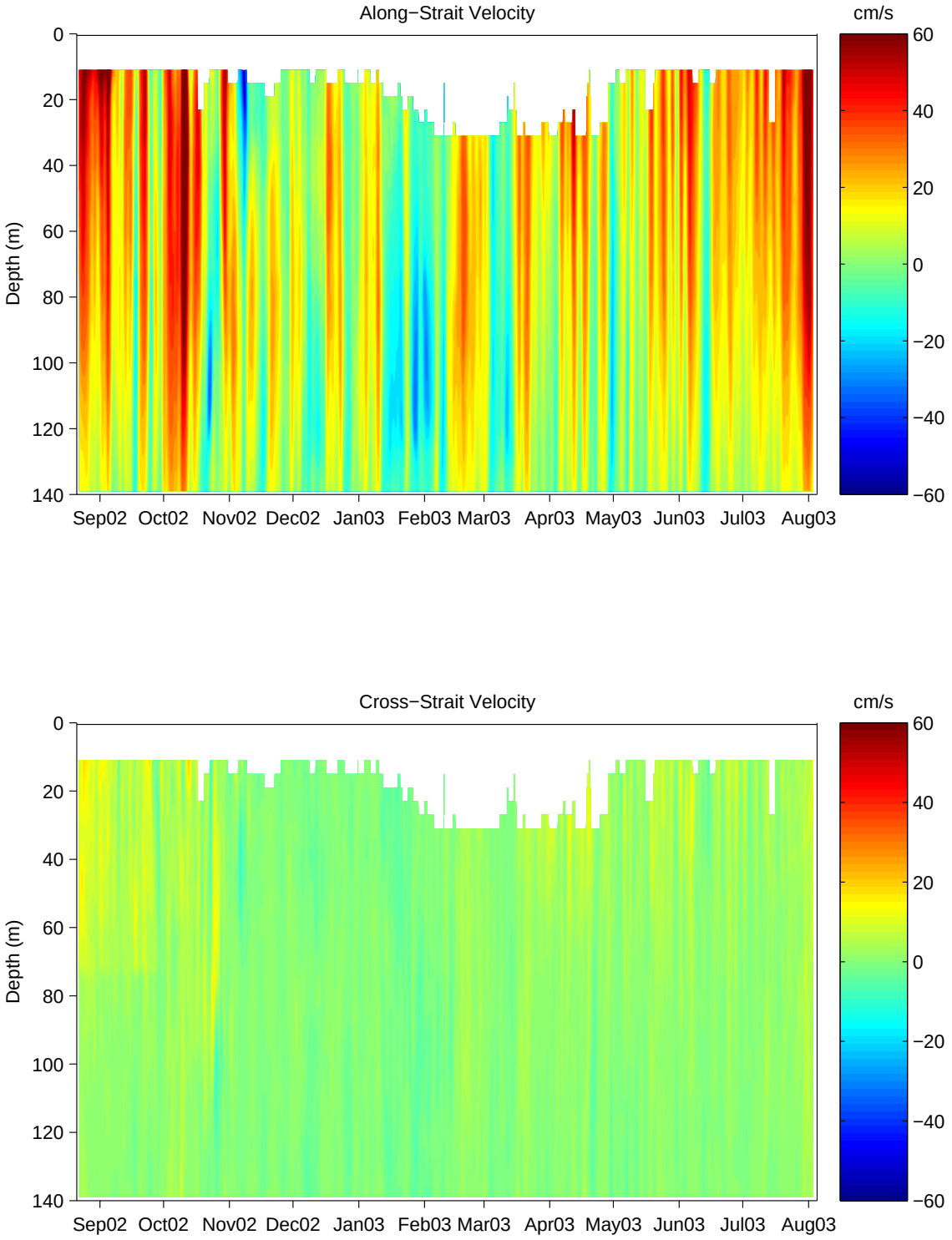


Figure 14 - Bihourly current data, North Side Barrow Strait
Sep. 1, 2002 – Sep. 30, 2002

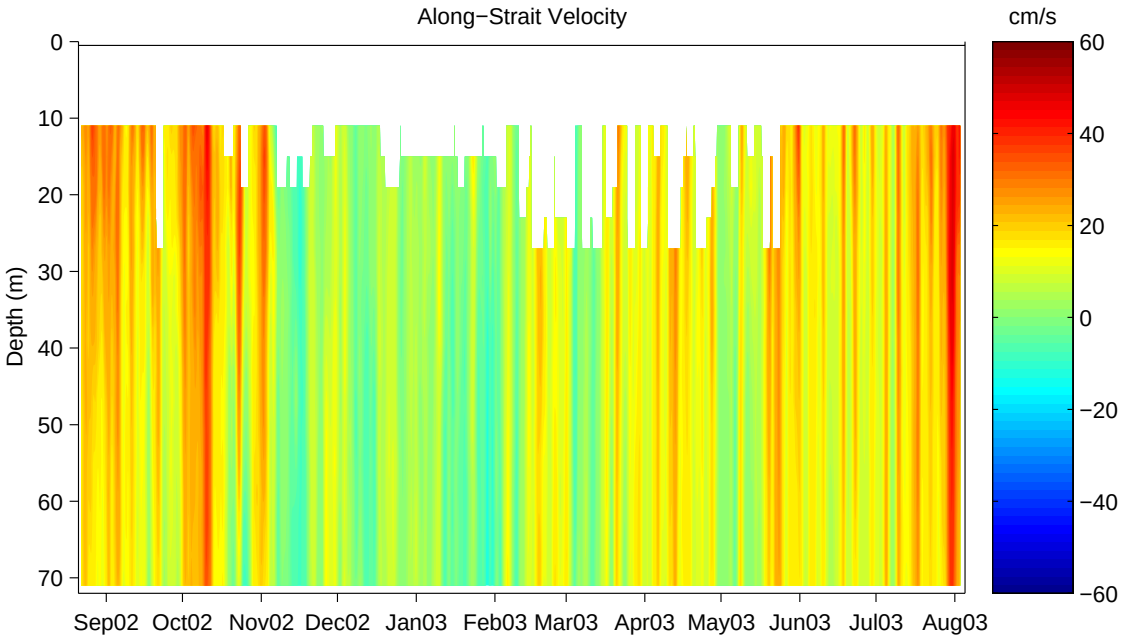




<u>Figure 15</u> - Low-pass filtered currents, South Side Barrow Strait
August 2002 - August 2003



<u>Figure 16</u> - Low-pass filtered currents, South-Central Barrow Strait
August 2002 - August 2003



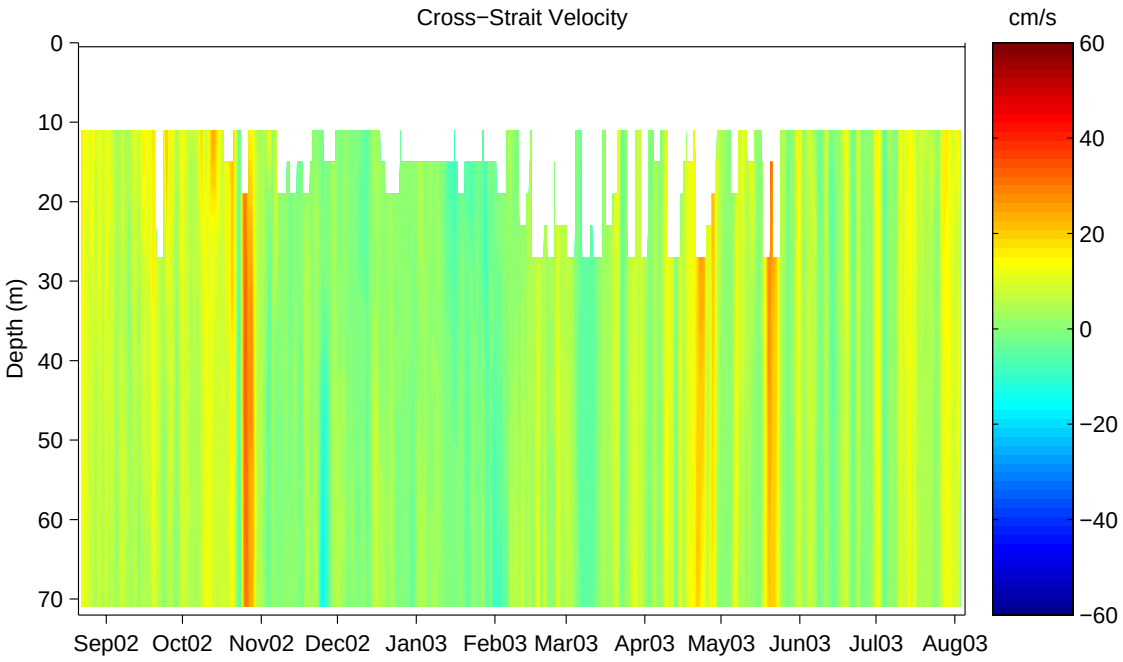
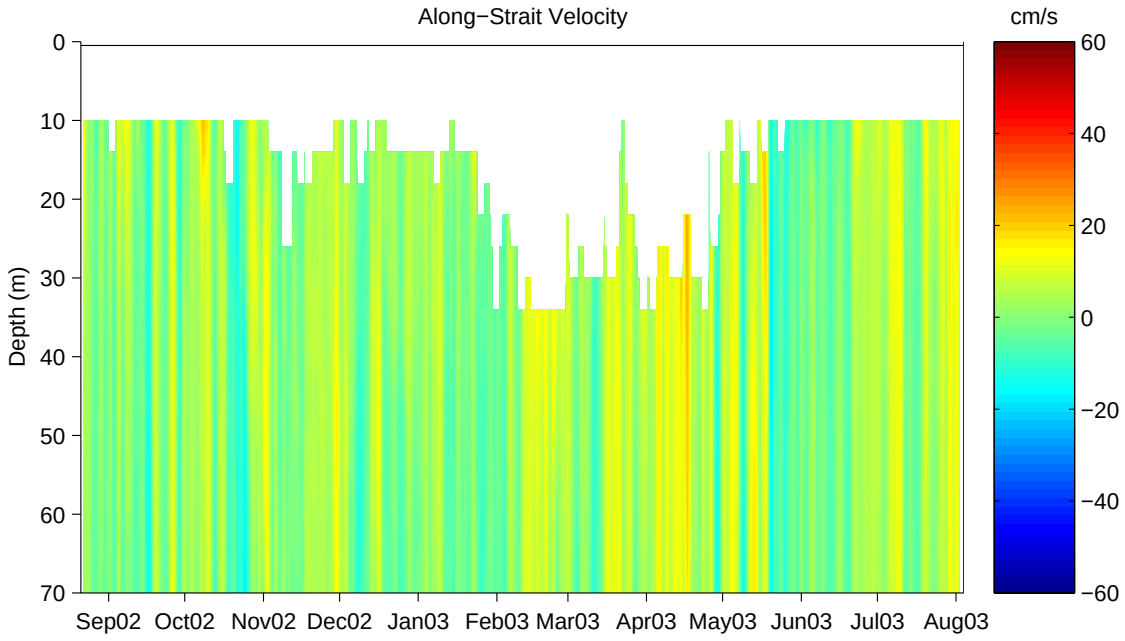
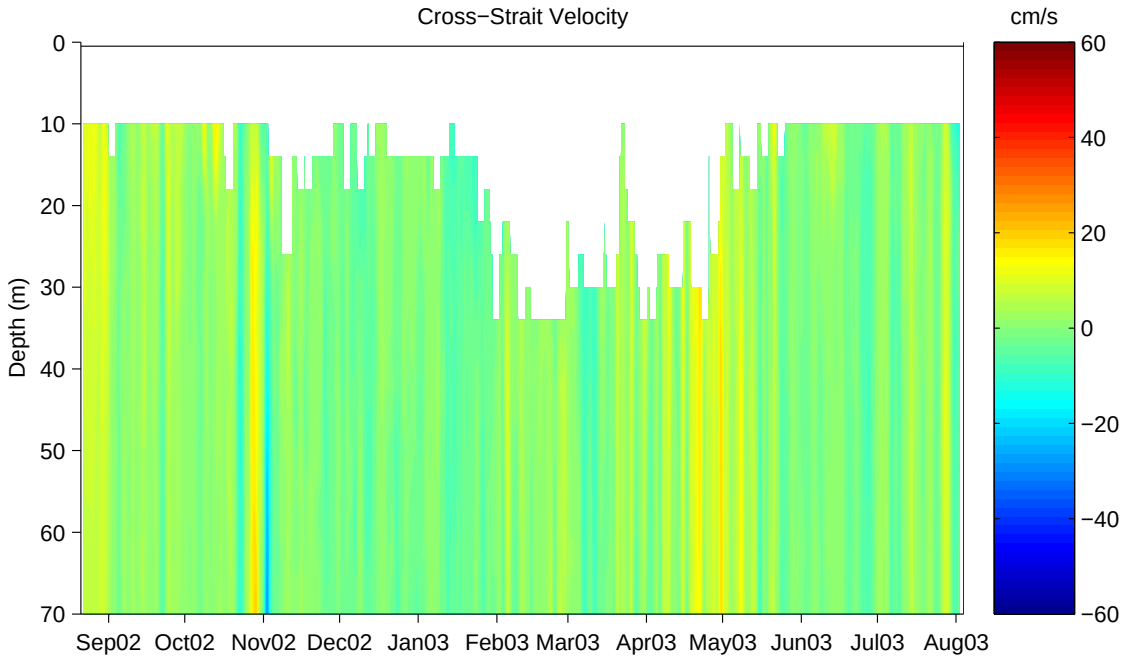
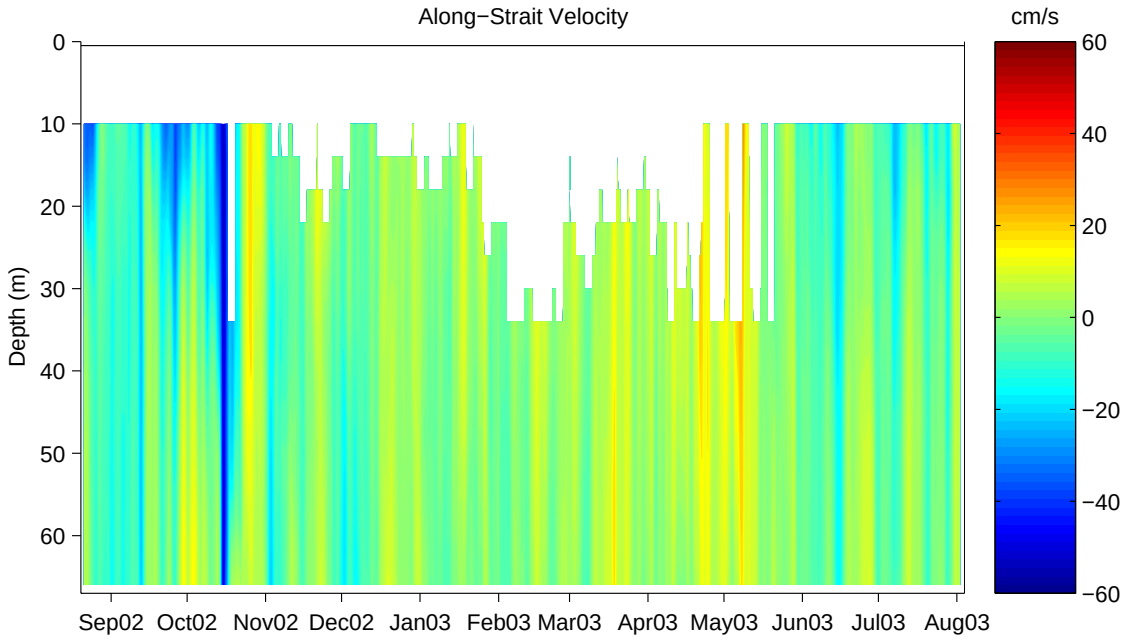


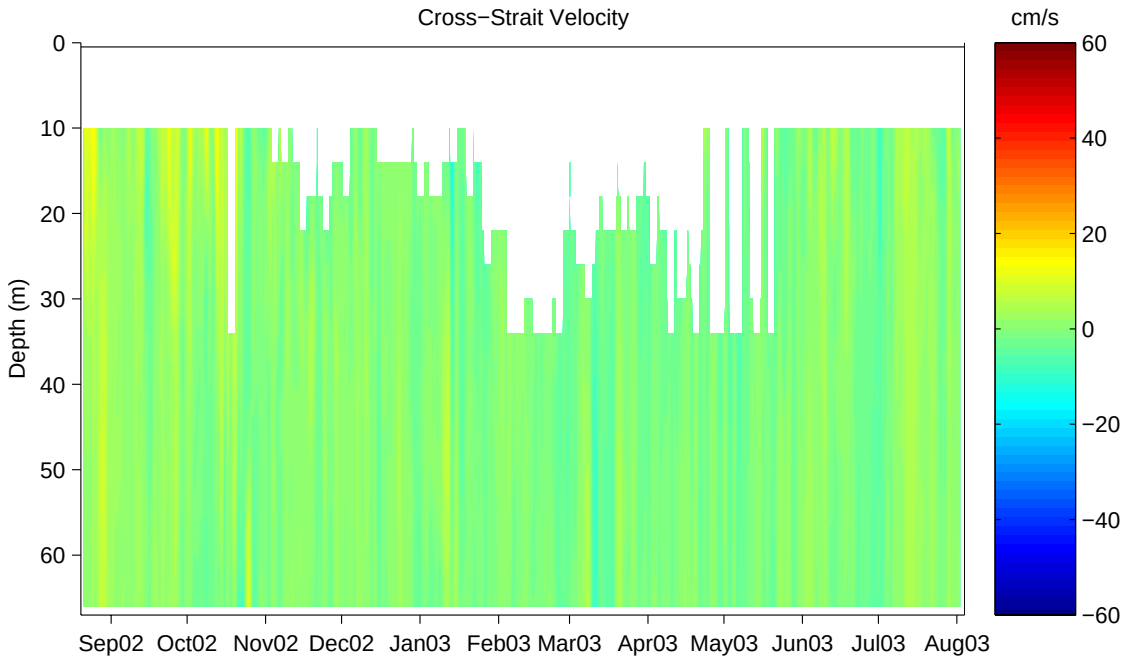
Figure 17 - Low-pass filtered currents, Central Barrow Strait
August 2002 - August 2003





<u>Figure 18</u> - Low-pass filtered currents, North Side Barrow Strait
August 2002 - August 2003





<u>Figure 19</u> – Icycler T,S (40 m.) and current data (36 m.). South Side Barrow Strait: August 2002 - August 2003.

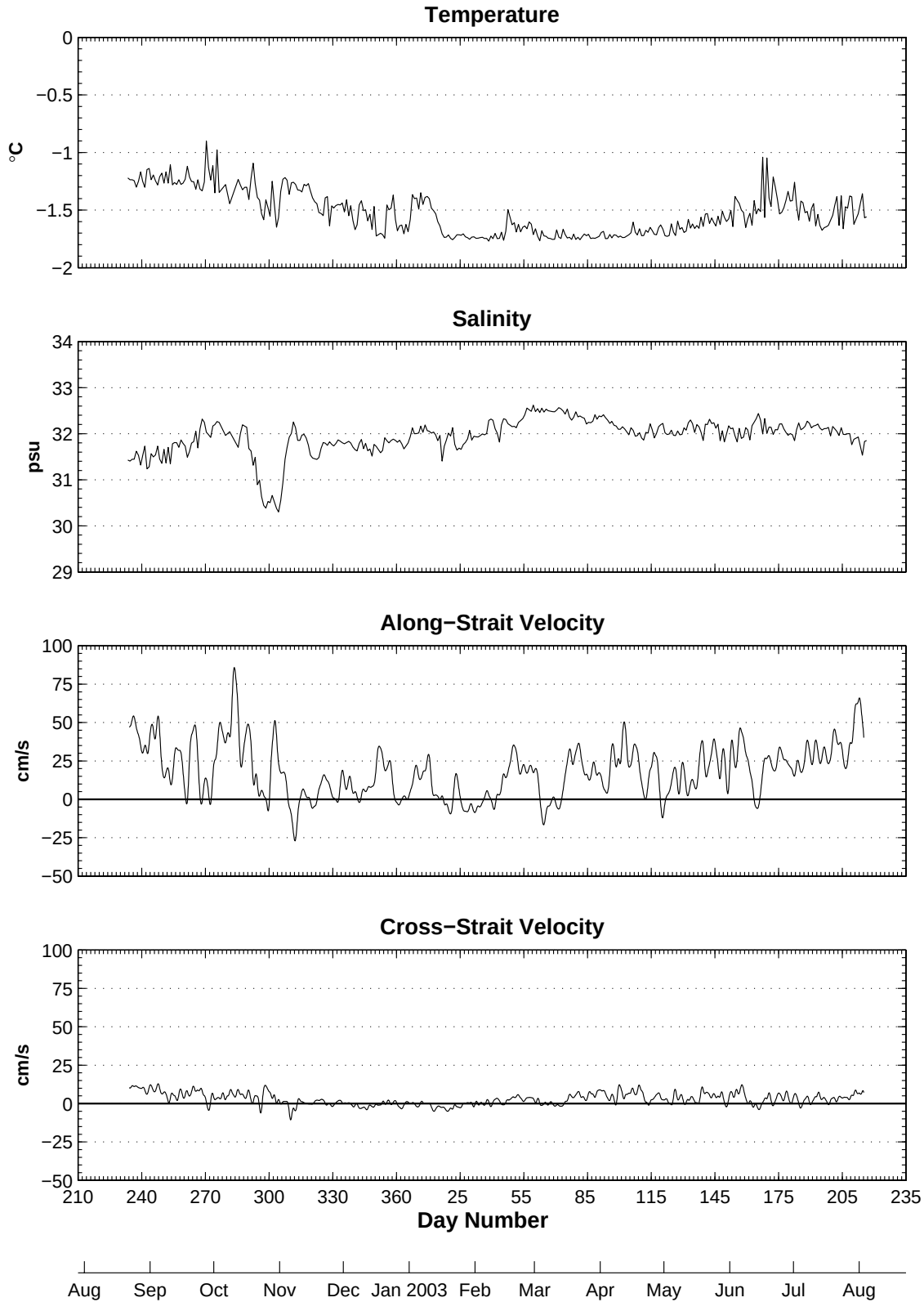
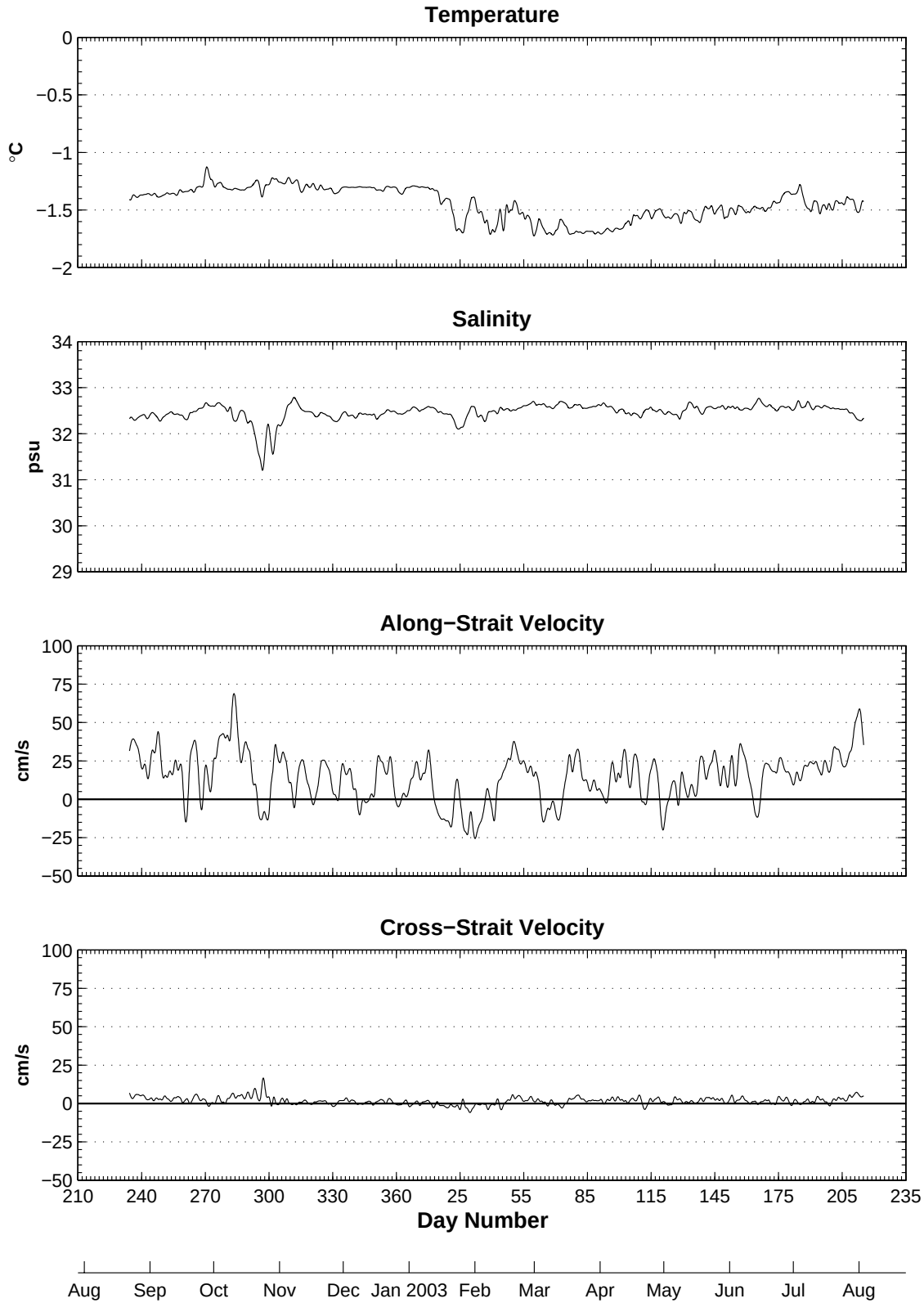


Figure 20 - Low-pass filtered T,S (79 m.) and current data (79 m.). South Side Barrow Strait: August 2002 - August 2003.



<u>Figure 21</u> - Low-pass filtered T,S (147 m.) and current data (139 m.). South Side Barrow Strait: August 2002 - August 2003.

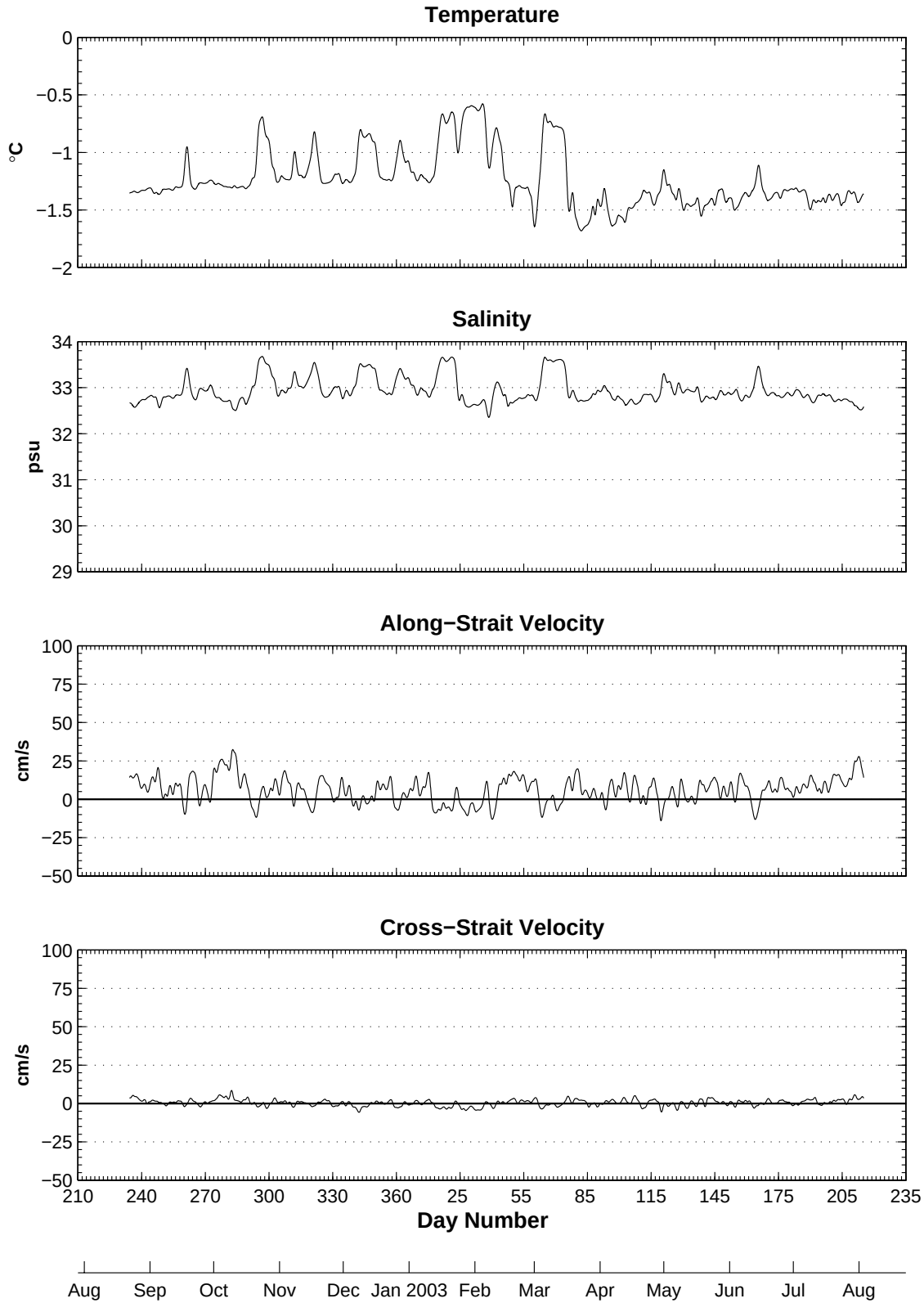


Figure 22 - Low-pass filtered T,S (40 m.) and current data (39 m.). South Central Barrow Strait: August 2002 - August 2003.

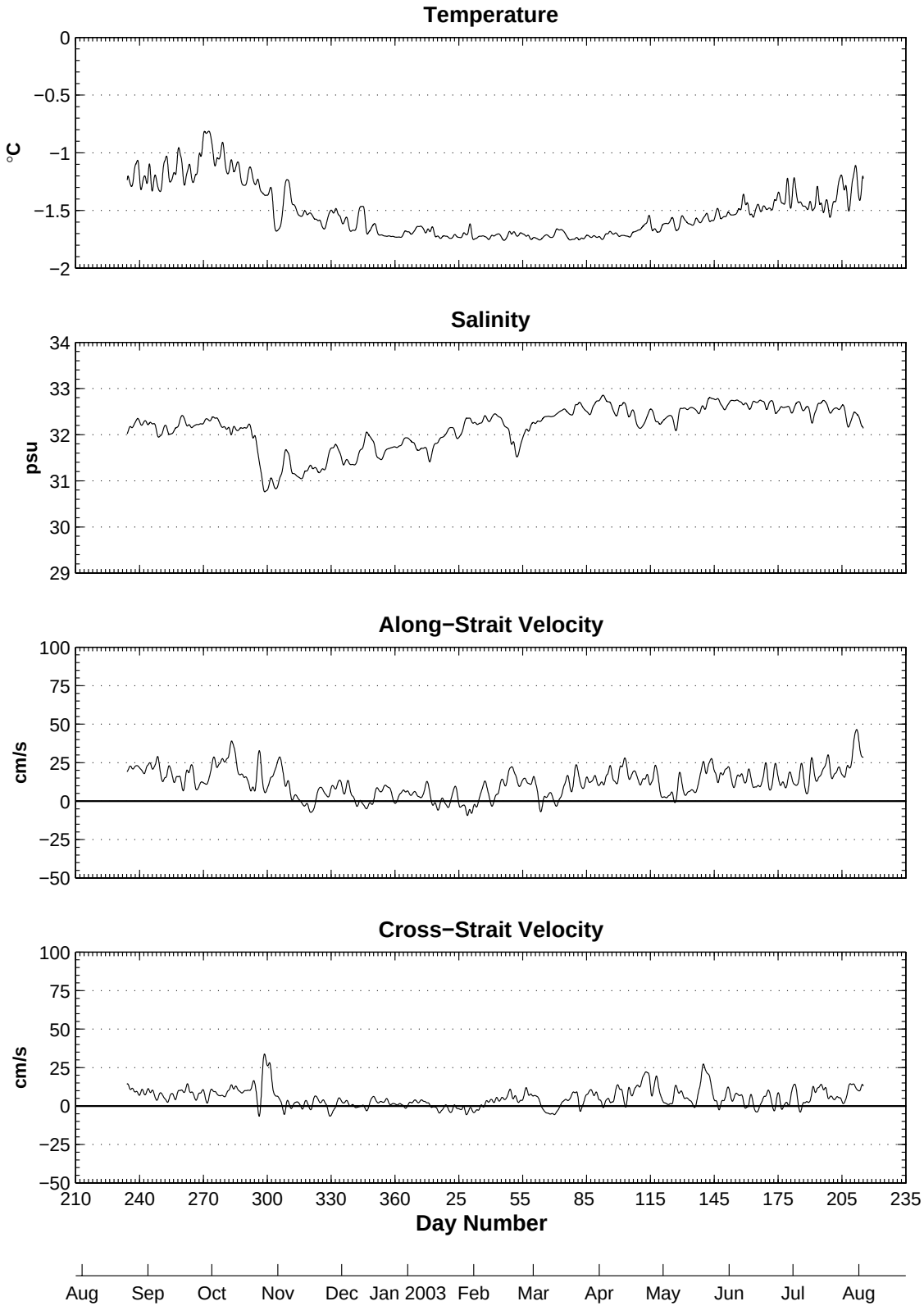


Figure 23 - Low-pass filtered T,S (79 m.) and current data (71 m.). South Central Barrow Strait: August 2002 - August 2003.

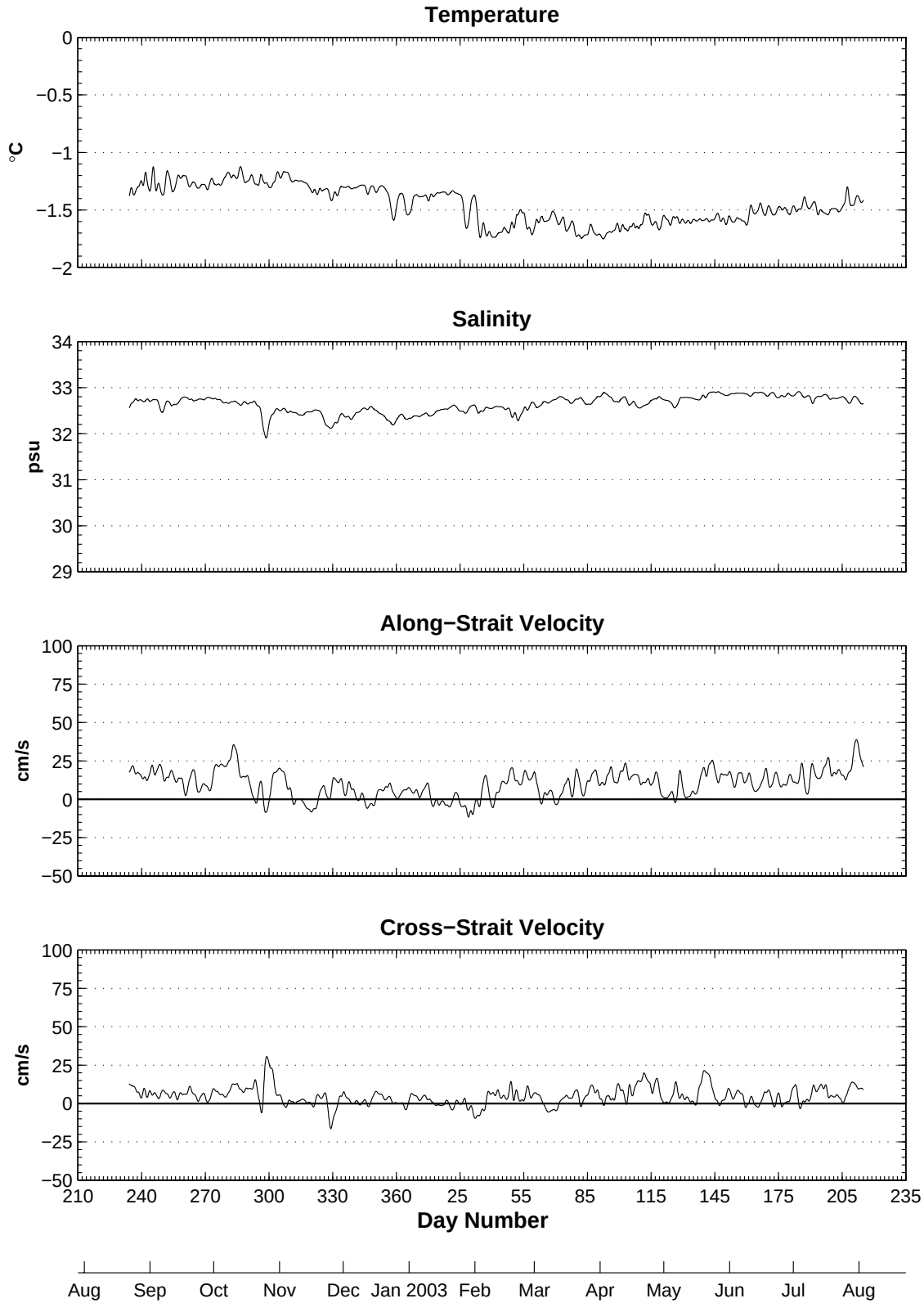


Figure 24 - Low-pass filtered T,S (157 m.).
South Central Barrow Strait: August 2002 - August 2003.

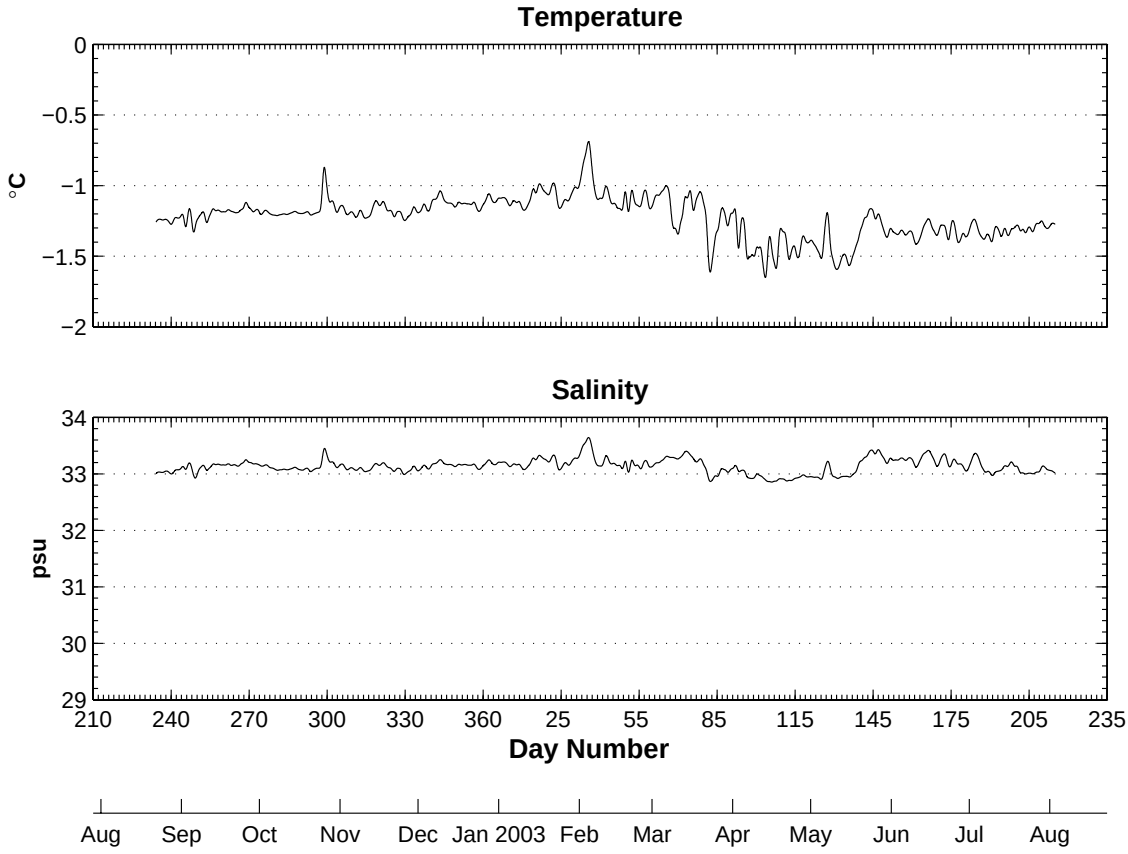


Figure 25 - Low-pass filtered T,S (274 m.).
South Central Barrow Strait: August 2002 - August 2003.

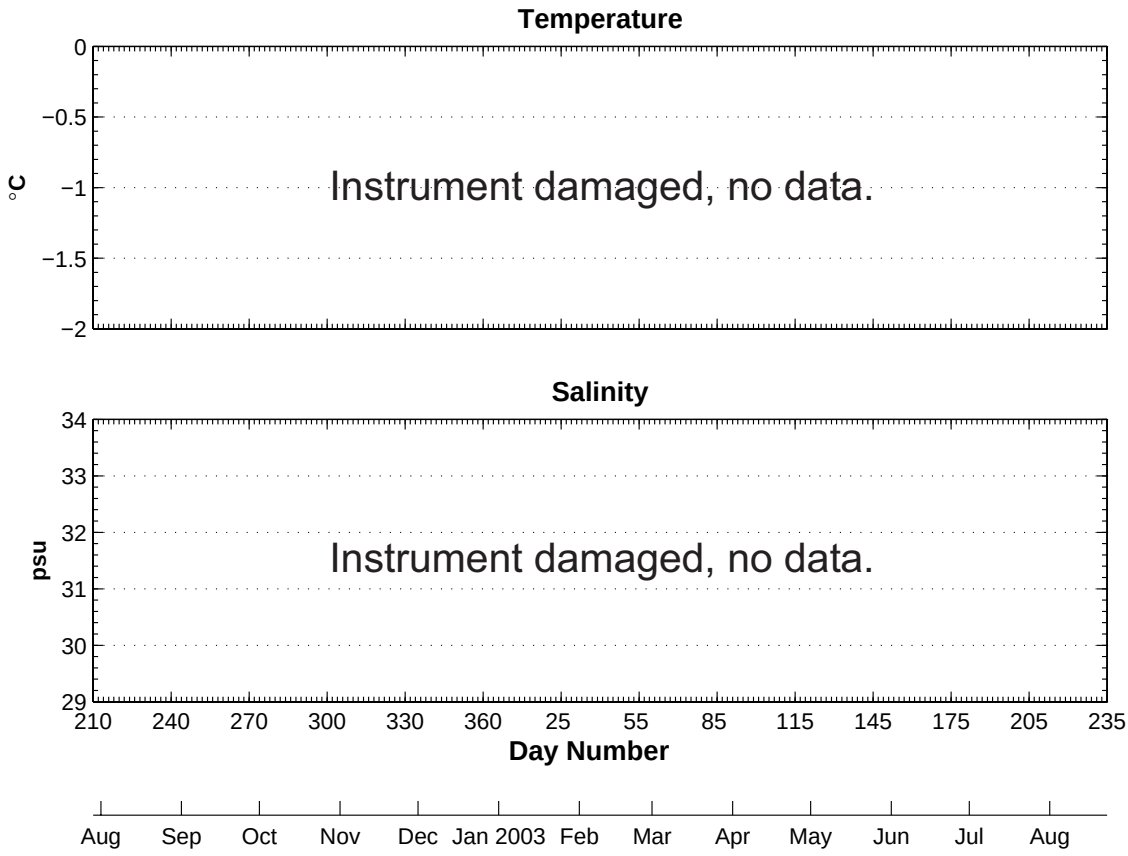


Figure 26 - Low-pass filtered T,S (38 m.) and current data (38 m.). Central Barrow Strait: August 2002 - August 2003.

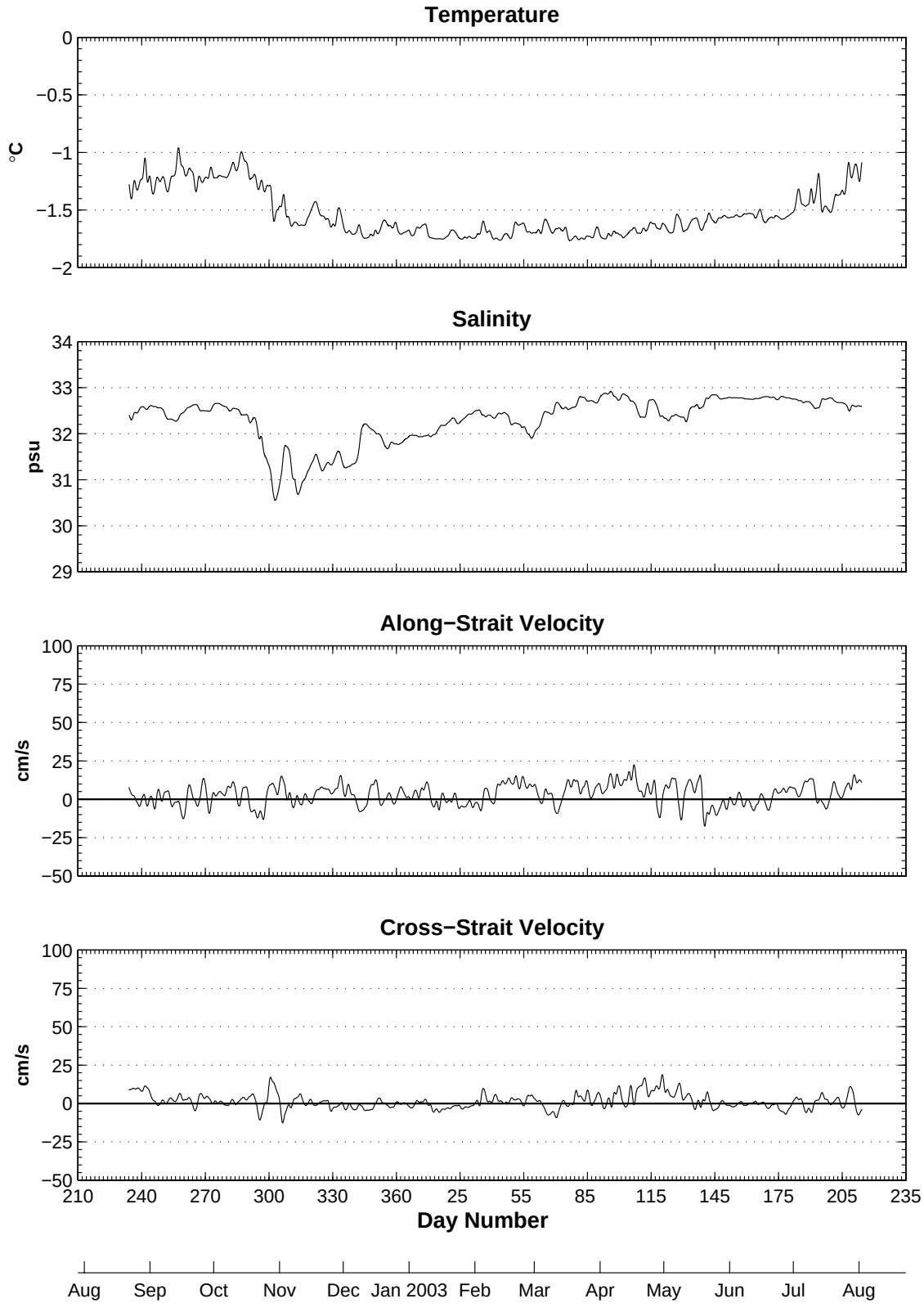


Figure 27 - Low-pass filtered T,S (78 m.) and current data (70 m.). Central Barrow Strait: August 2002 - August 2003.

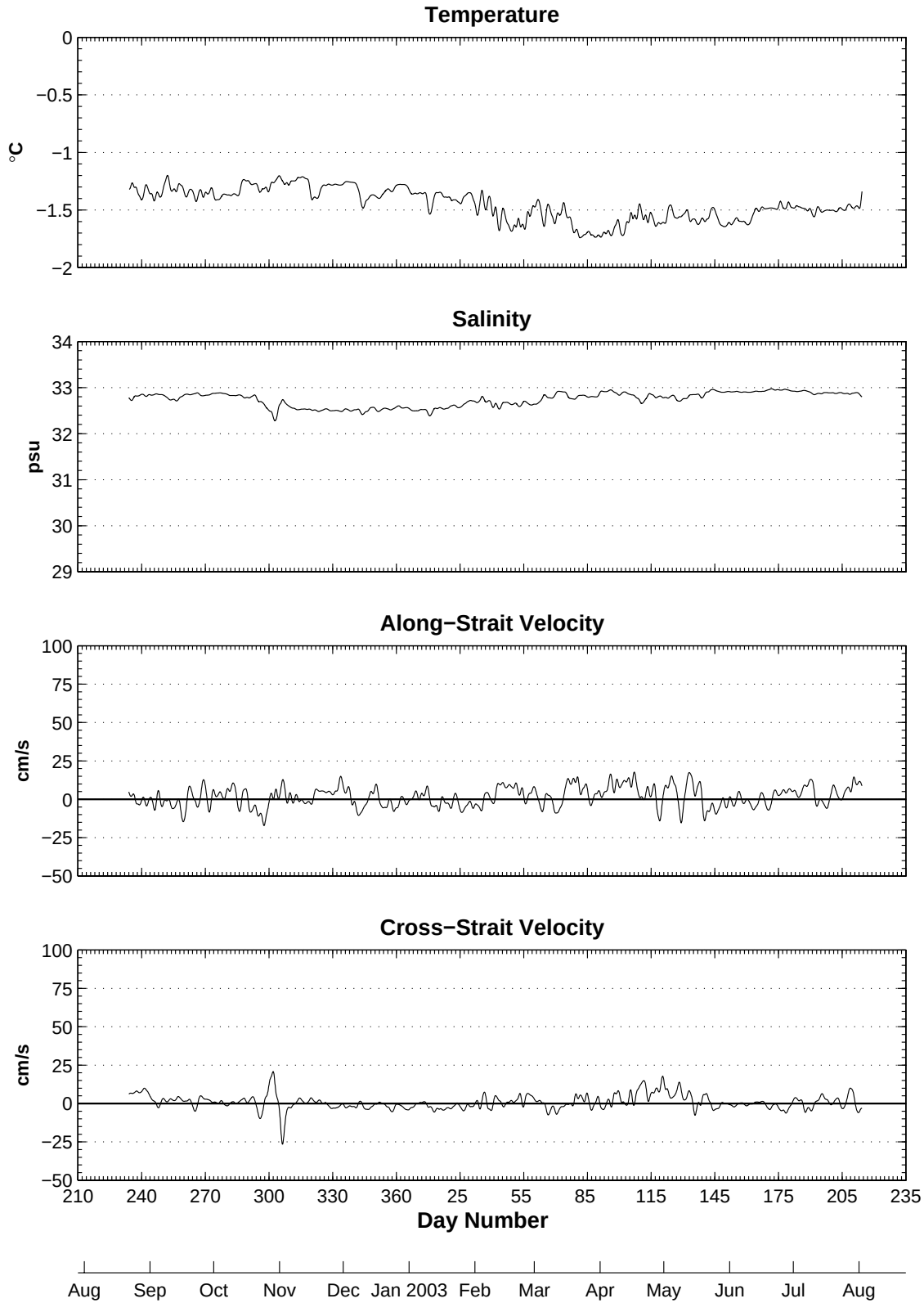


Figure 28 - Low-pass filtered T,S (157 m.).
Central Barrow Strait: August 2002 - August 2003.

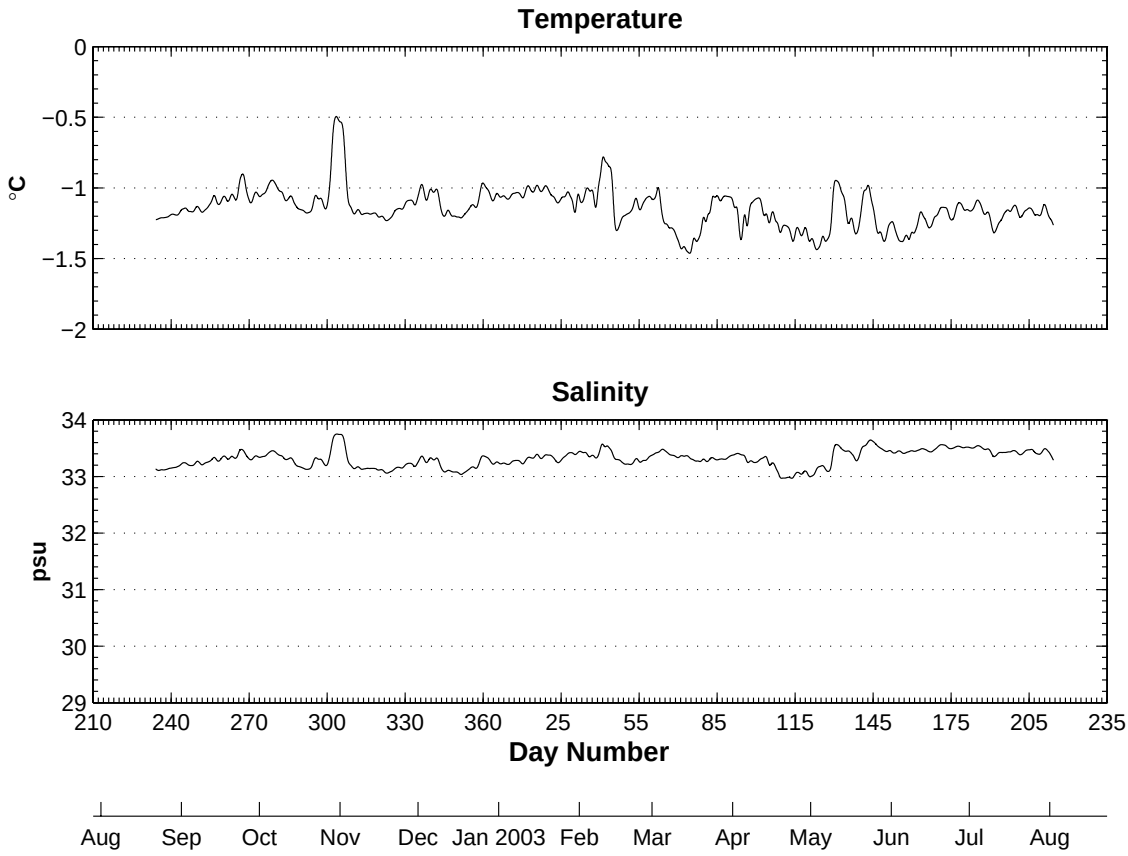


Figure 29 - Low-pass filtered T,S (37 m.) and current data (38 m.). North Side Barrow Strait: August 2002 - August 2003.

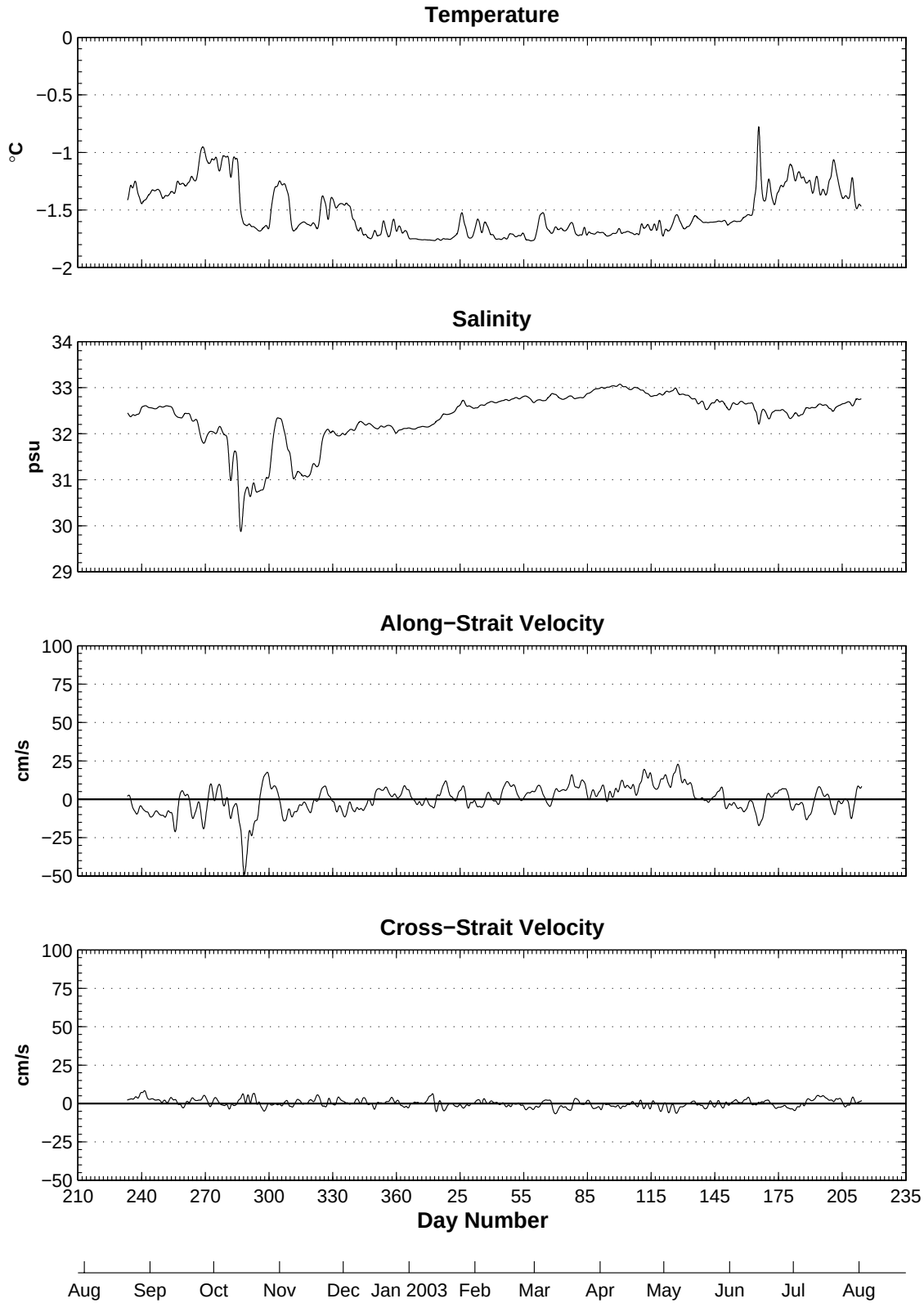


Figure 30 - Low-pass filtered T,S (74 m.) and current data (66 m.). North Side Barrow Strait: August 2002 - August 2003.

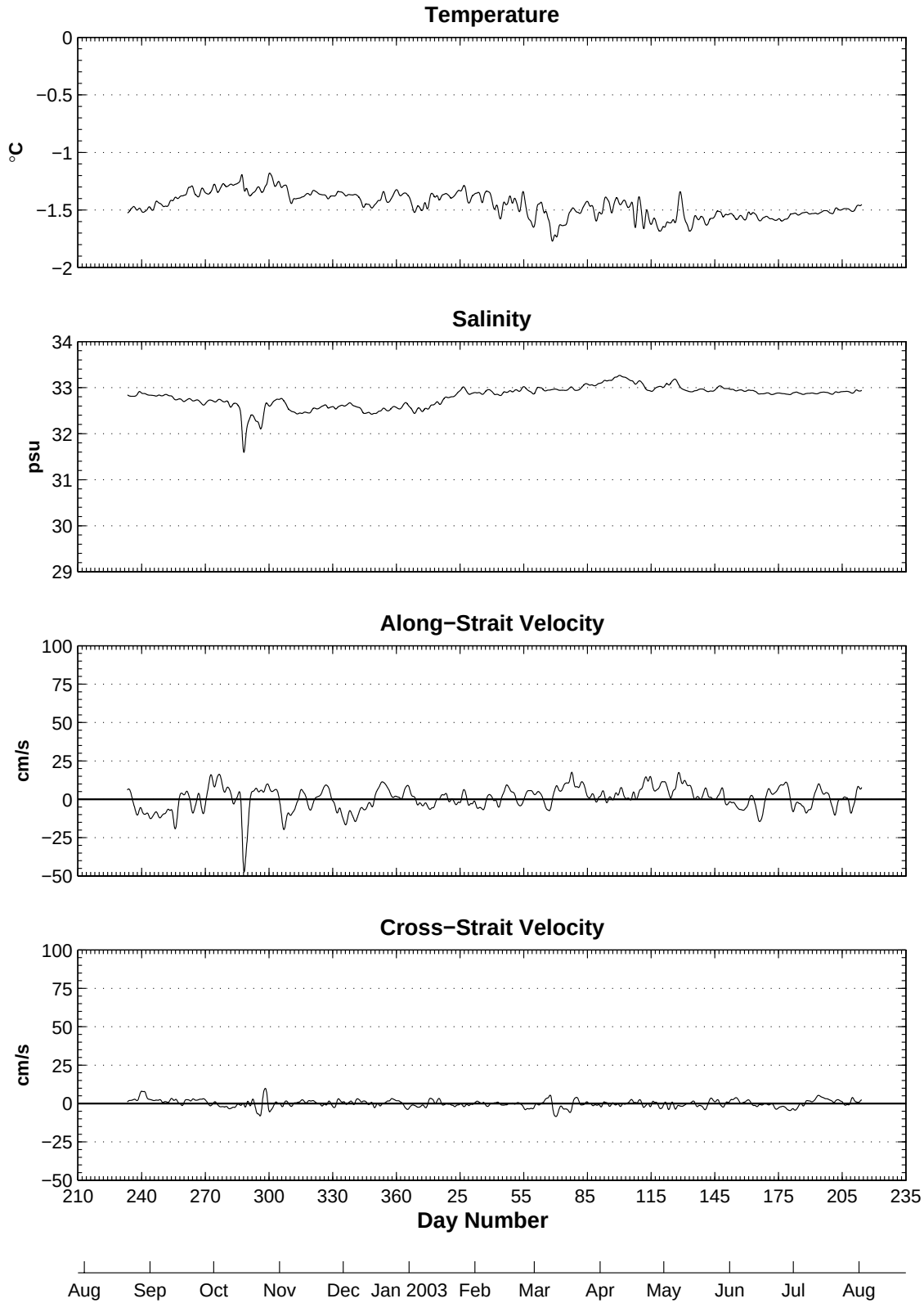


Figure 31 - Low-pass filtered T,S (153 m.).
North Side Barrow Strait: August 2002 - August 2003.

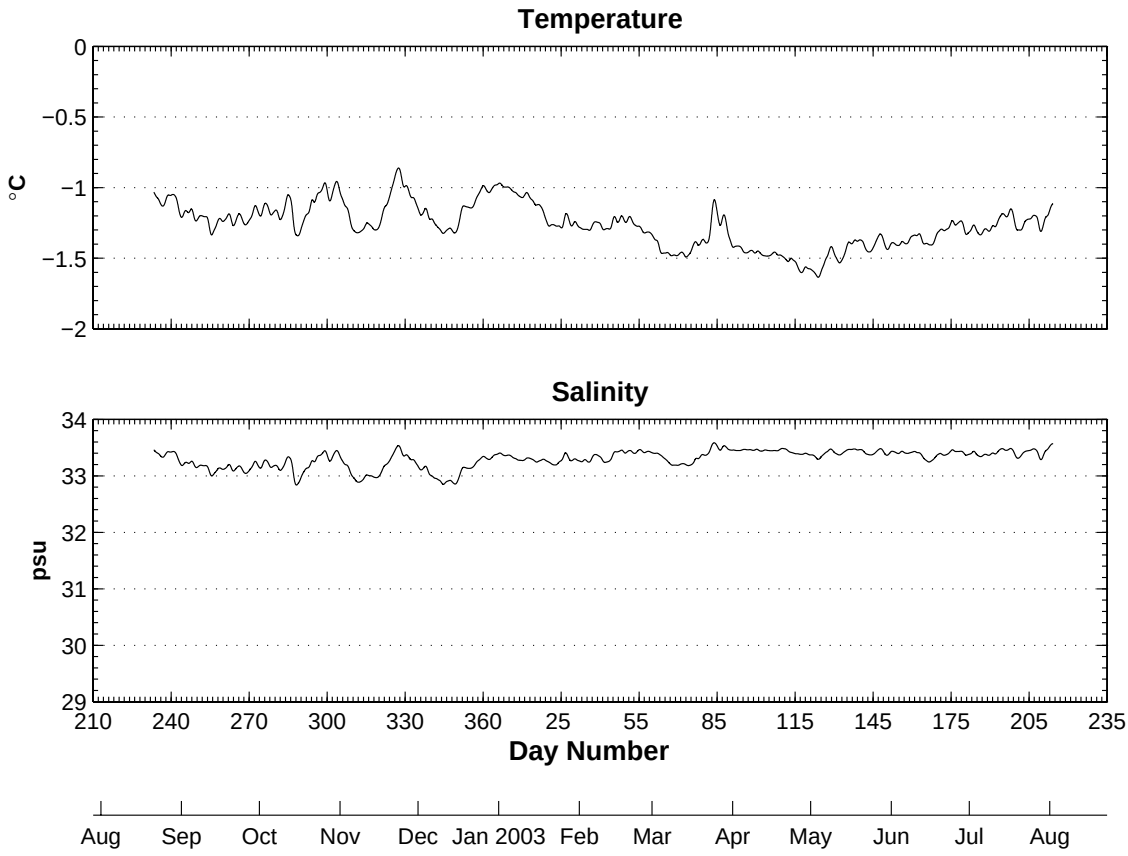
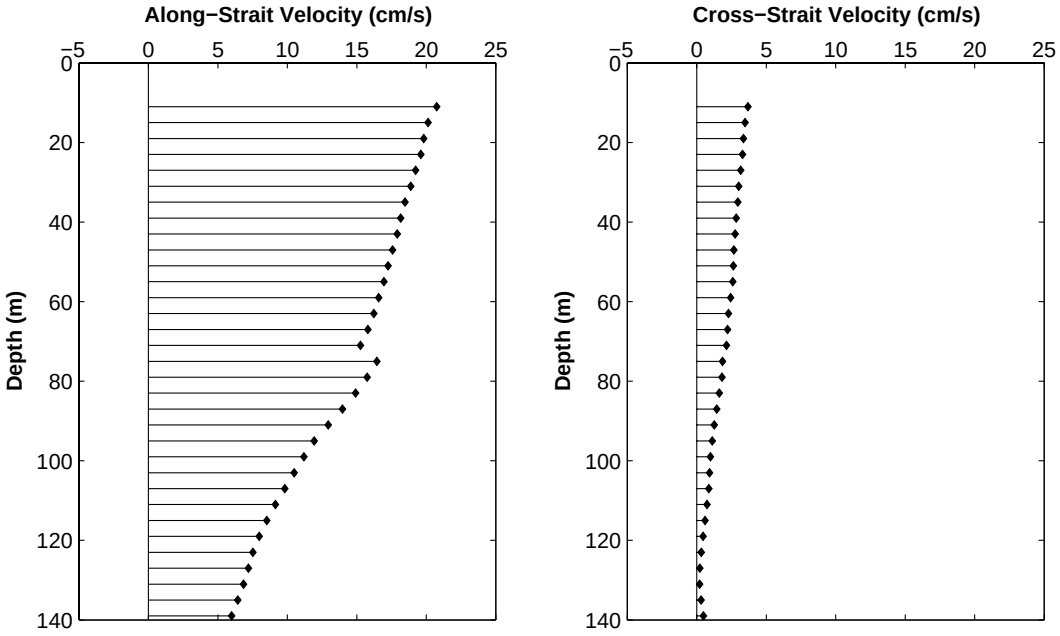


Figure 32: Mean Flows, August 20, 2002 to August 04, 2003

South side of Barrow Strait



South−Central Barrow Strait

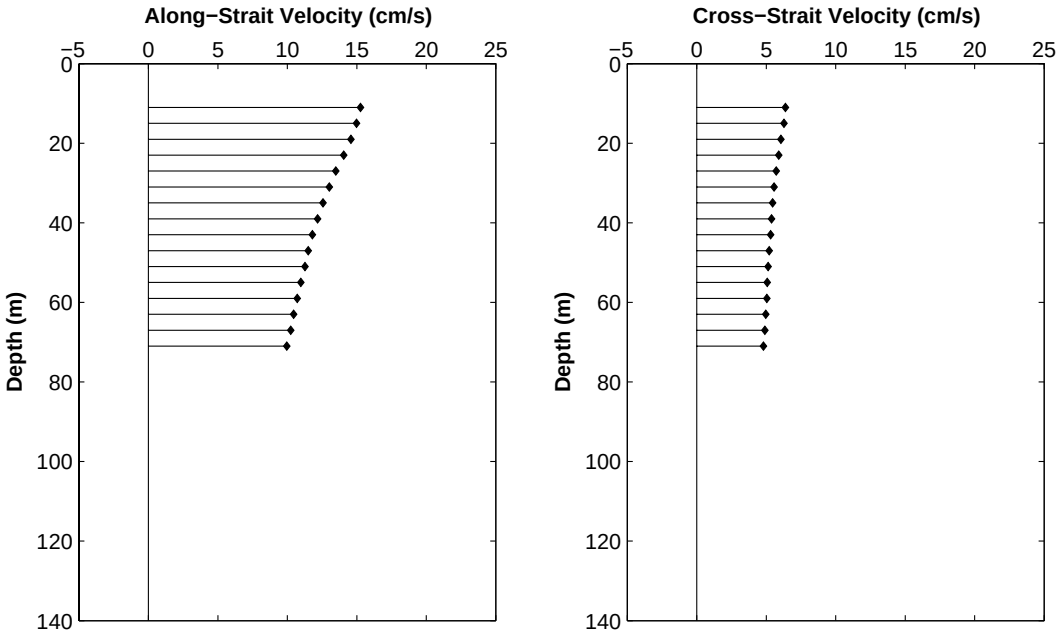
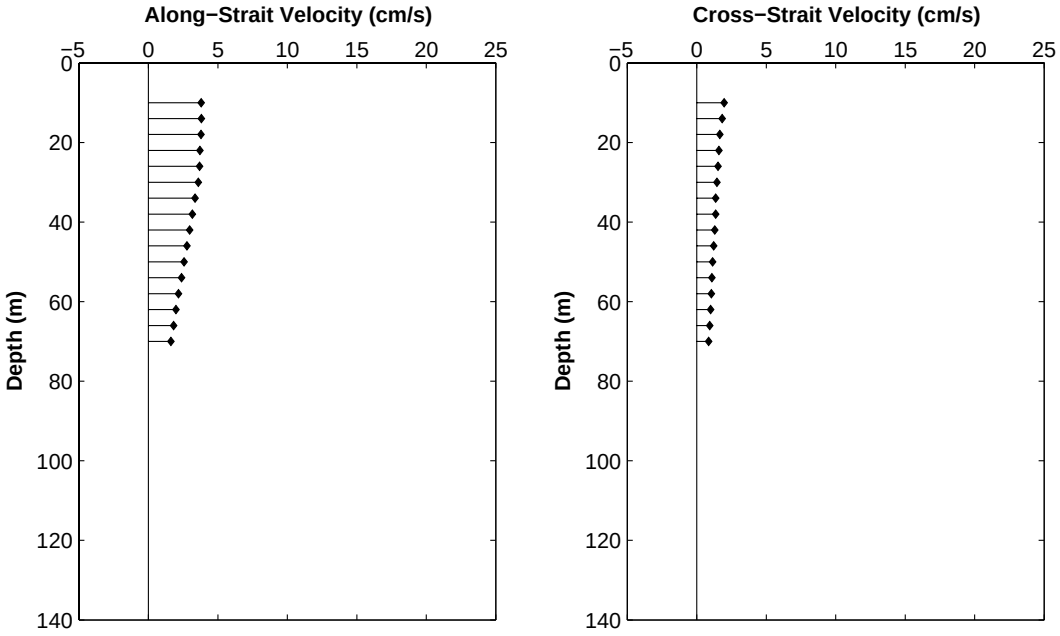


Figure 32: Mean Flows, August 20, 2002 to August 03, 2003

Central Barrow Strait



North side of Barrow Strait

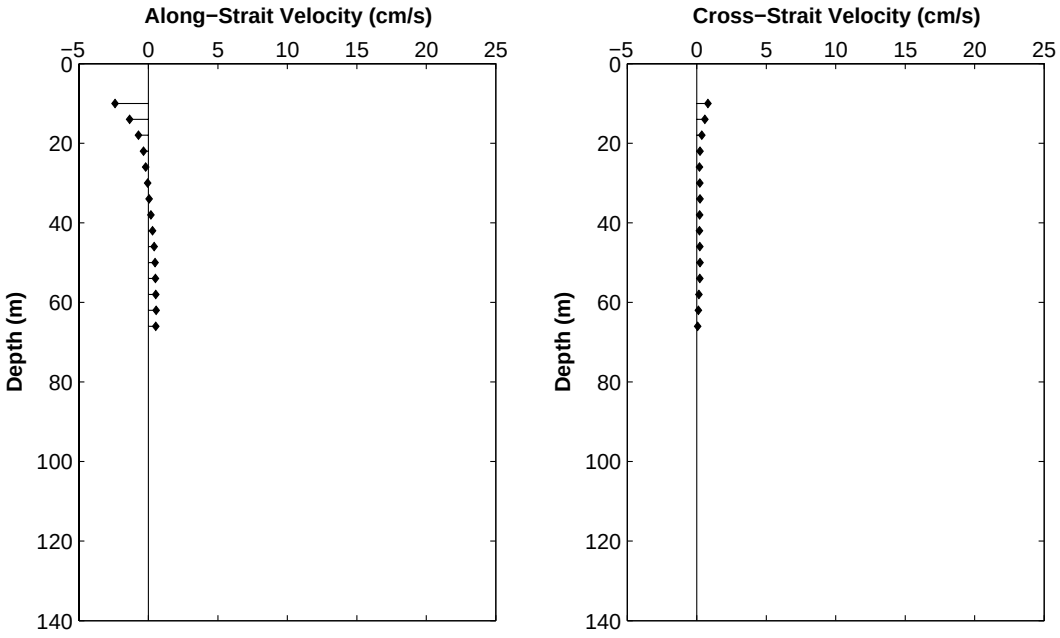
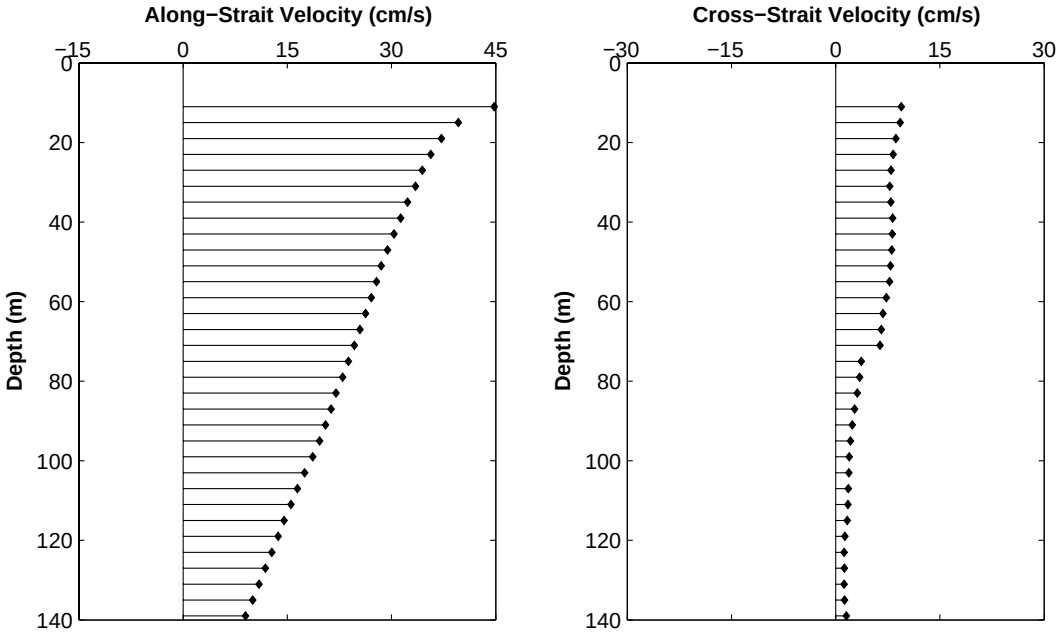


Figure 33: Mean Flows, Late Summer August 2002 to September 2002

South side of Barrow Strait



South−Central Barrow Strait

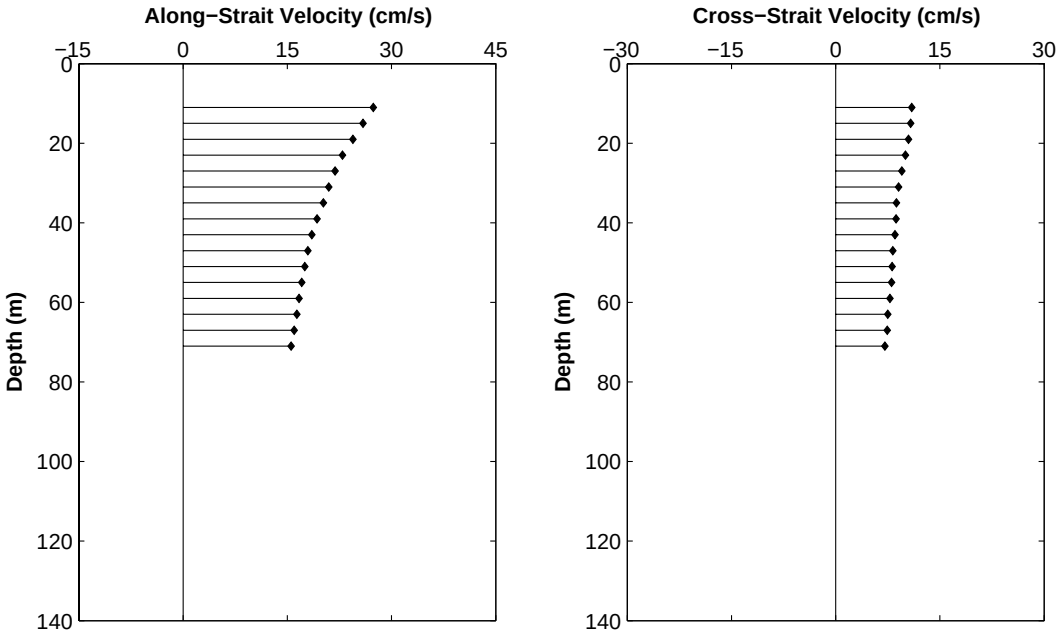
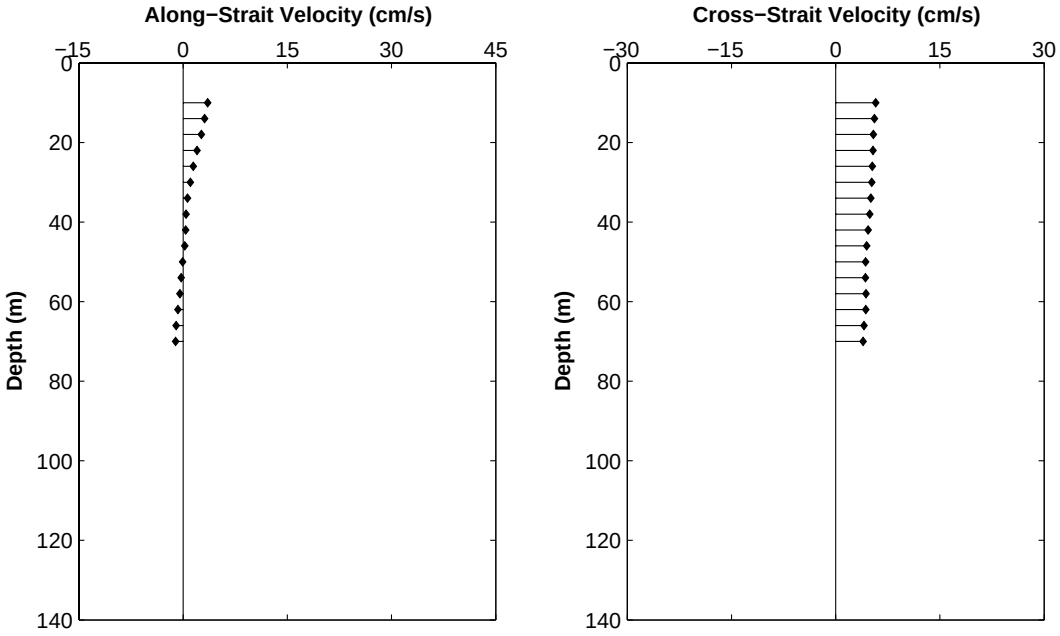


Figure 33: Mean Flows, Late Summer: August 2002 to September 2002

Central Barrow Strait



North side of Barrow Strait

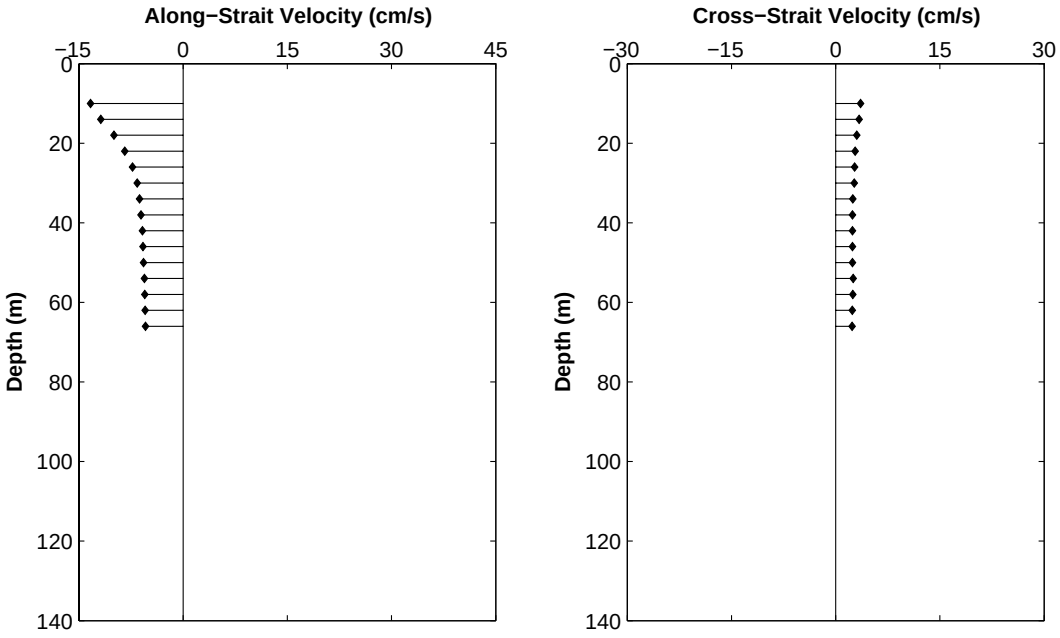
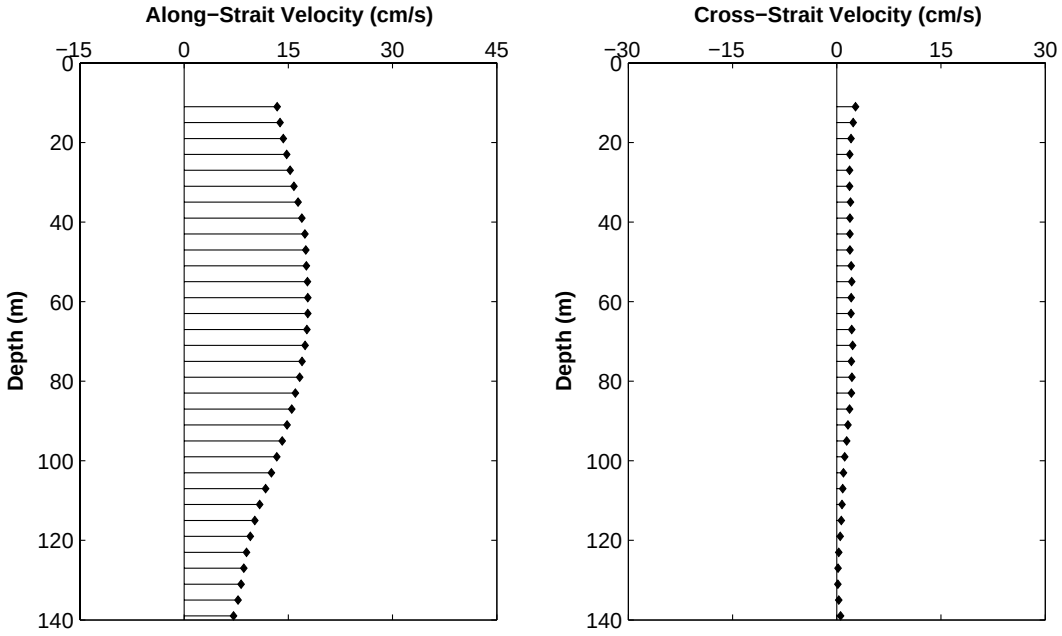


Figure 34: Mean Flows, Fall: September 2002 to December 2002

South side of Barrow Strait



South−Central Barrow Strait

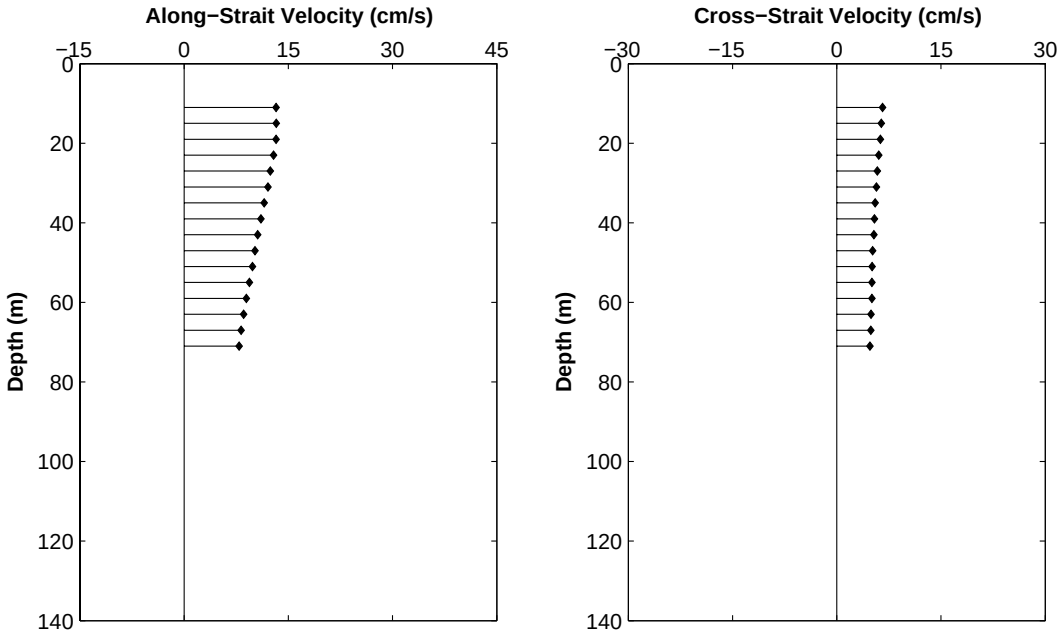
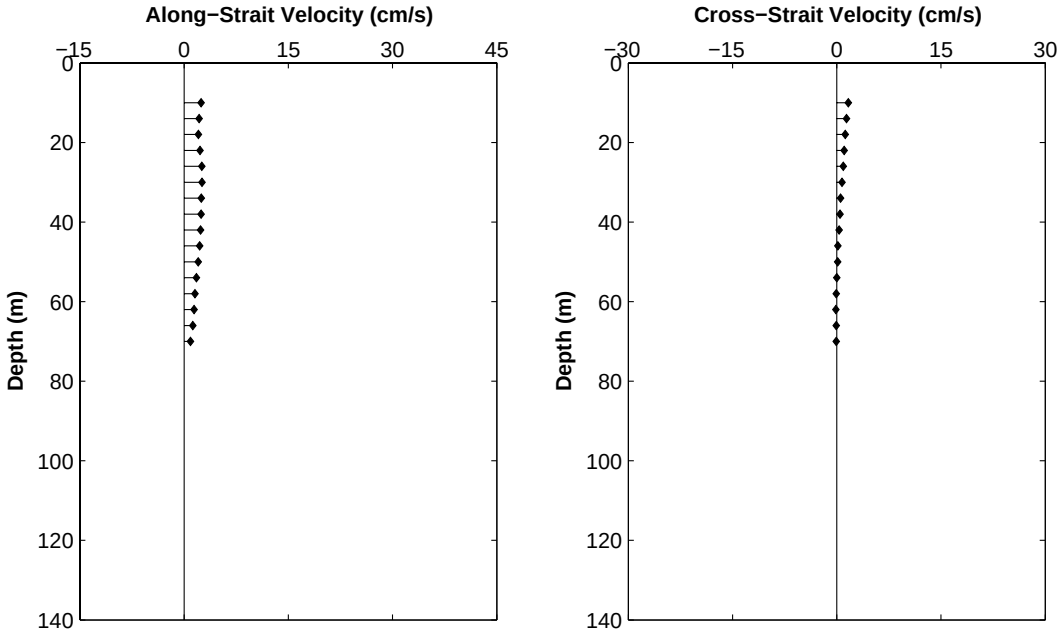


Figure 34: Mean Flows, Fall: September 2002 to December 2002

Central Barrow Strait



North side of Barrow Strait

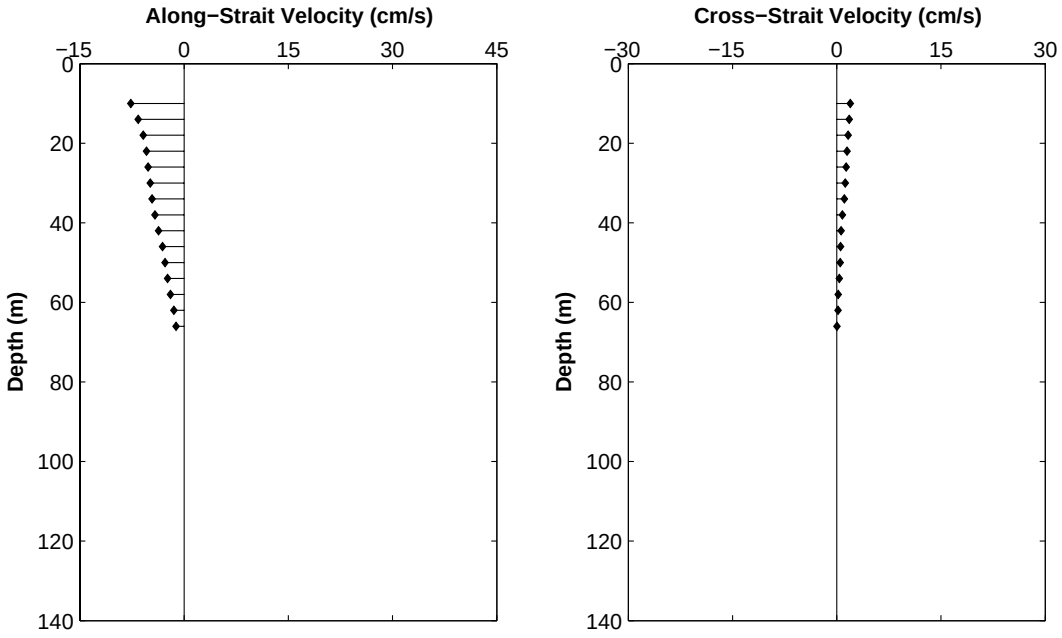
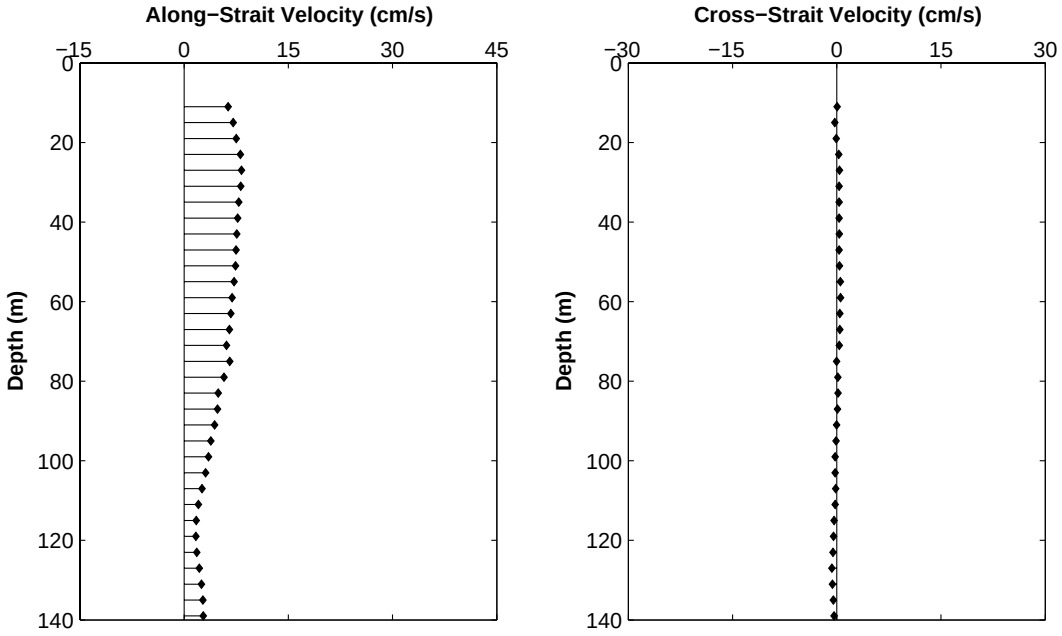


Figure 35: Mean Flows, Winter: December 2002 to March 2003

South side of Barrow Strait



South−Central Barrow Strait

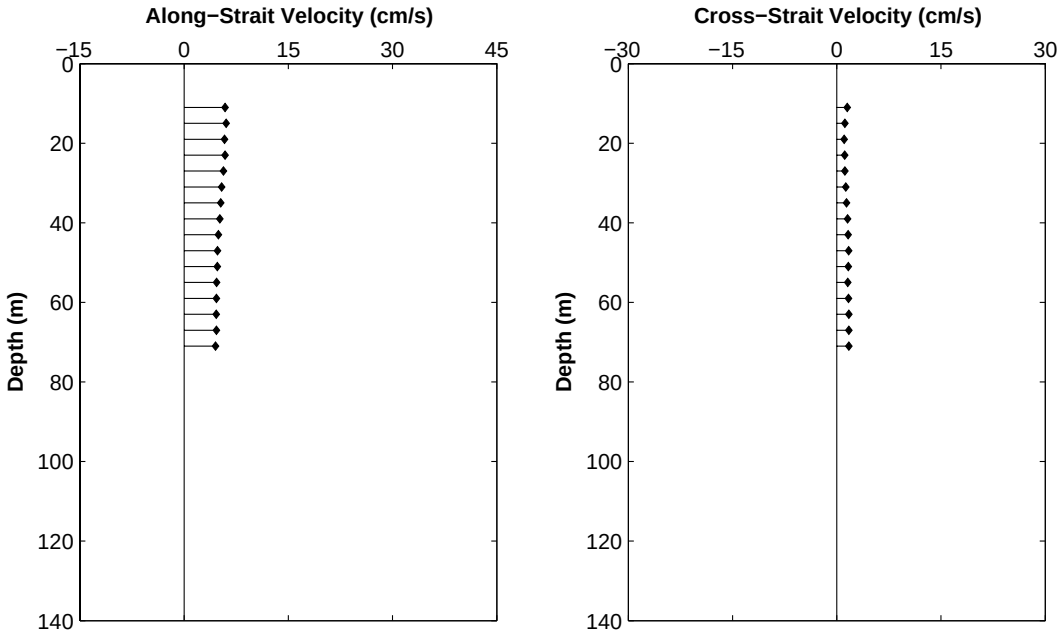
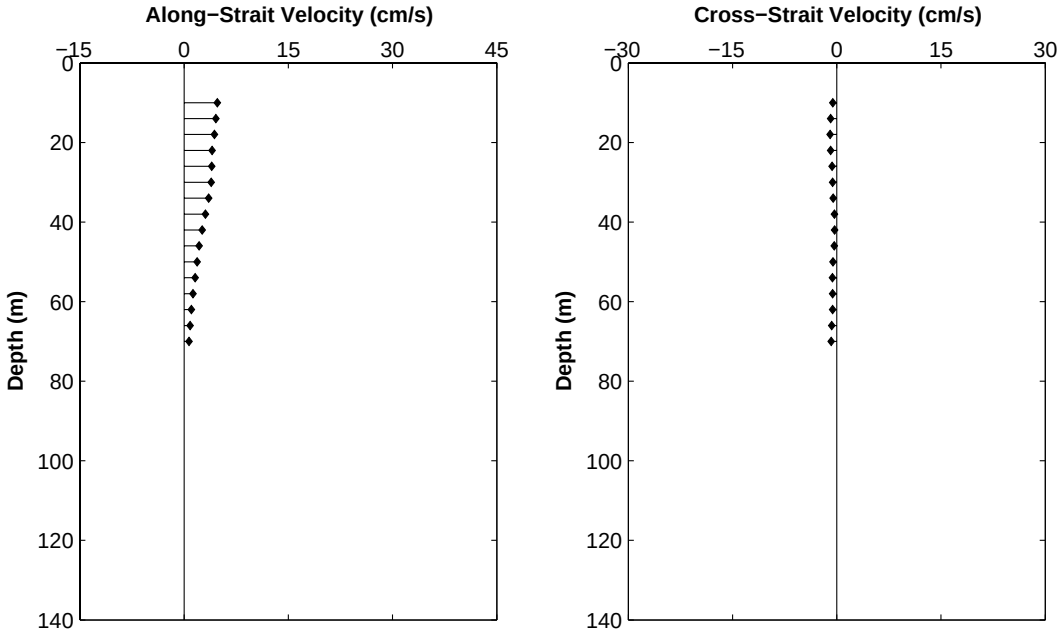


Figure 35: Mean Flows, Winter: December 2002 to March 2003

Central Barrow Strait



North side of Barrow Strait

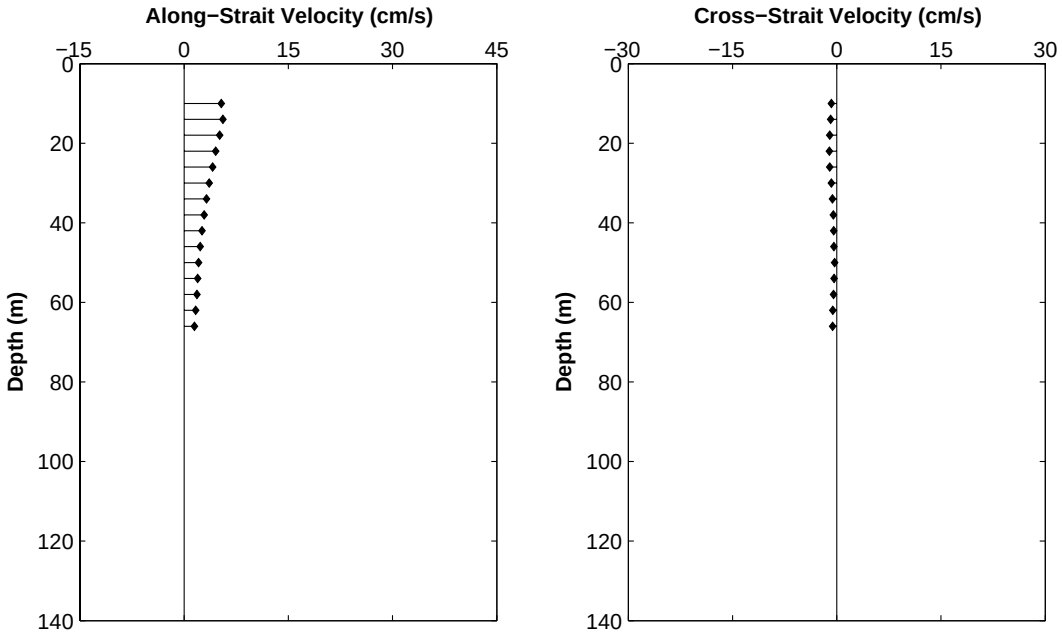
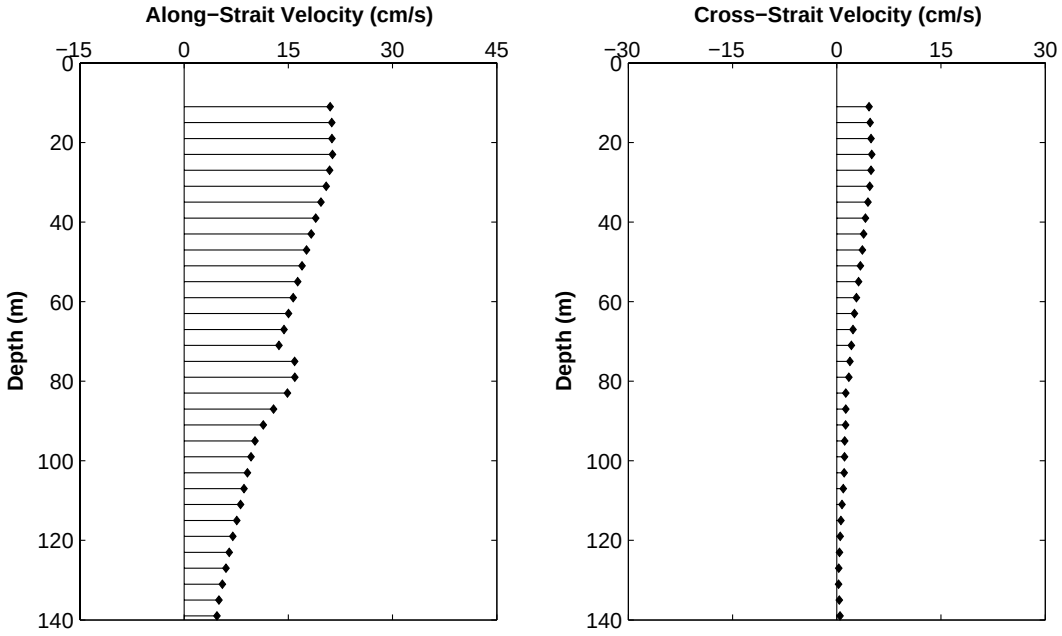


Figure 36: Mean Flows, Spring: March 2003 to June 2003

South side of Barrow Strait



South−Central Barrow Strait

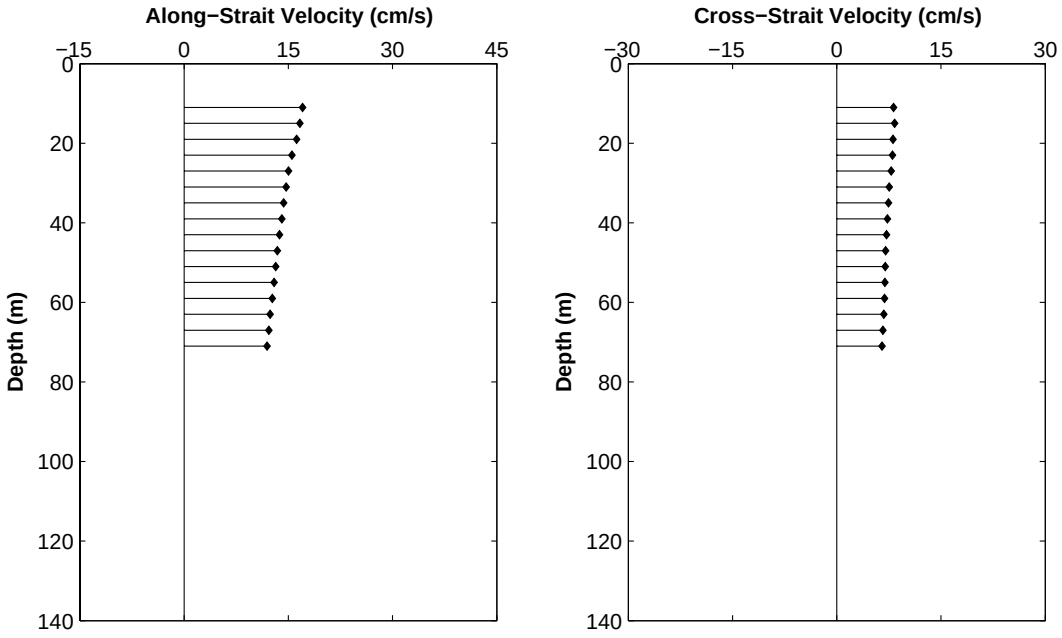
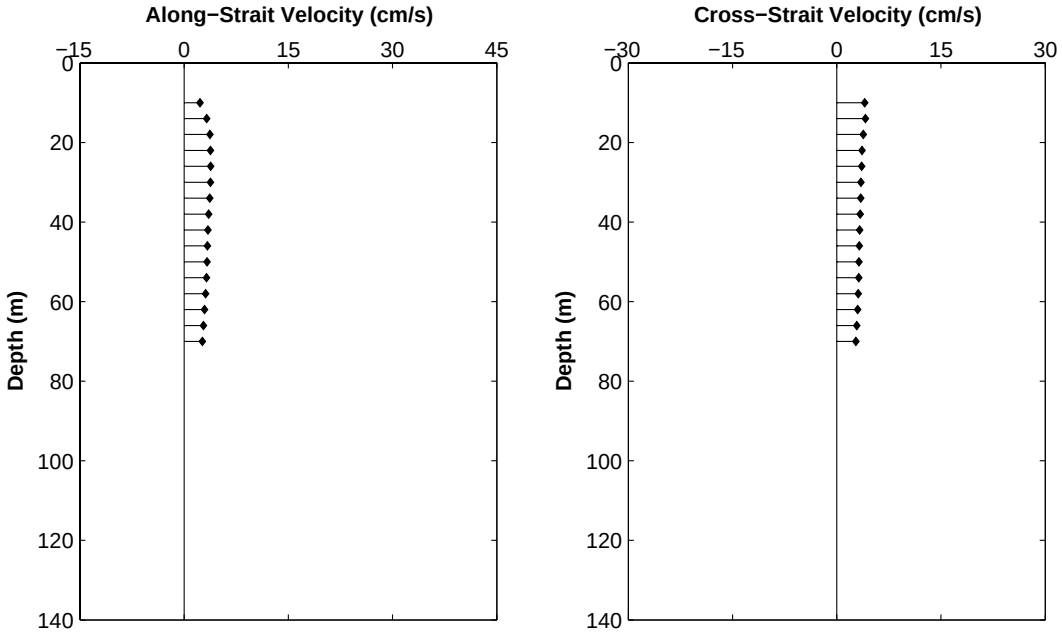


Figure 36: Mean Flows, Spring: March 2003 to June 2003

Central Barrow Strait



North side of Barrow Strait

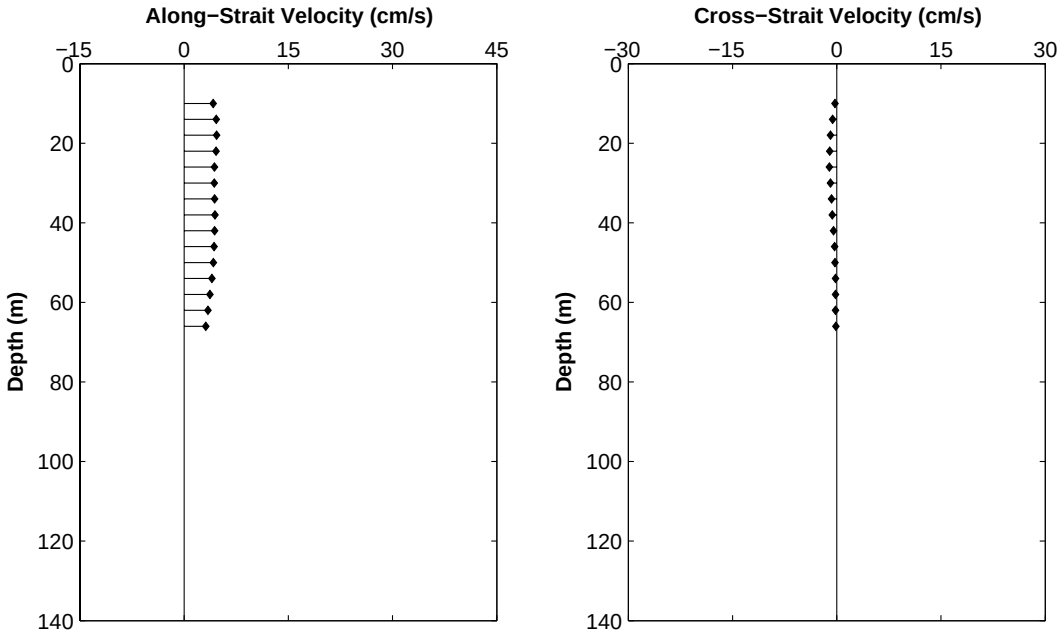
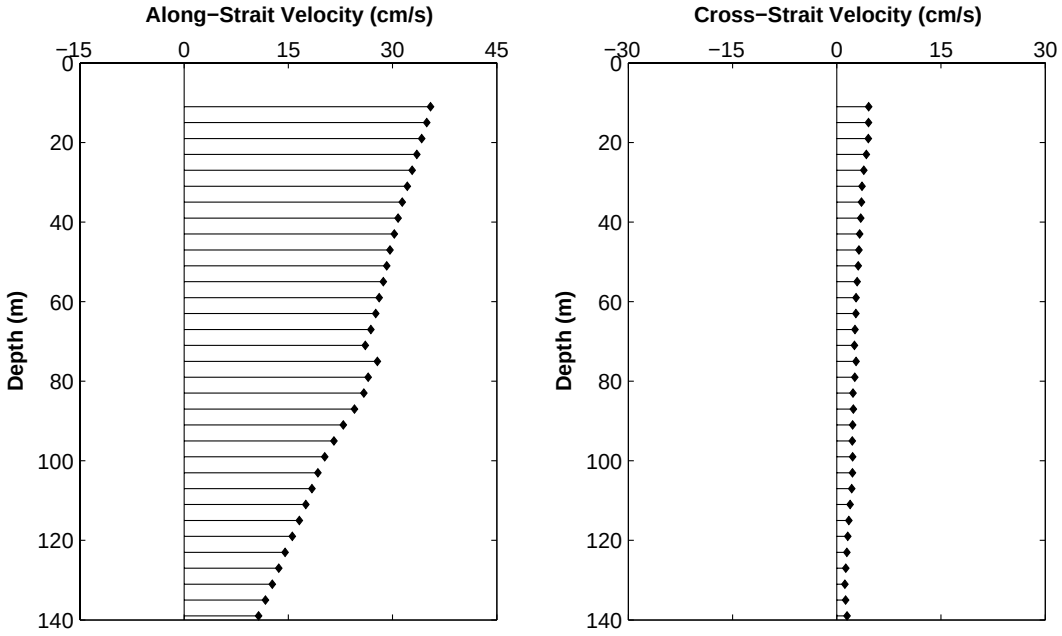


Figure 37: Mean Flows, Early Summer: June 2003 to August 2003

South side of Barrow Strait



South−Central Barrow Strait

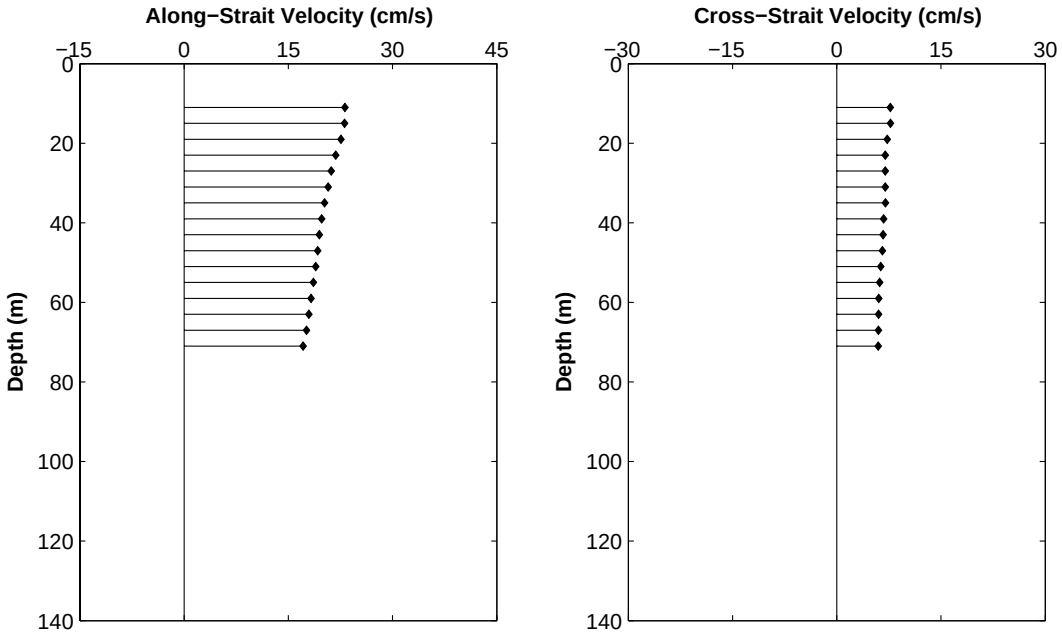
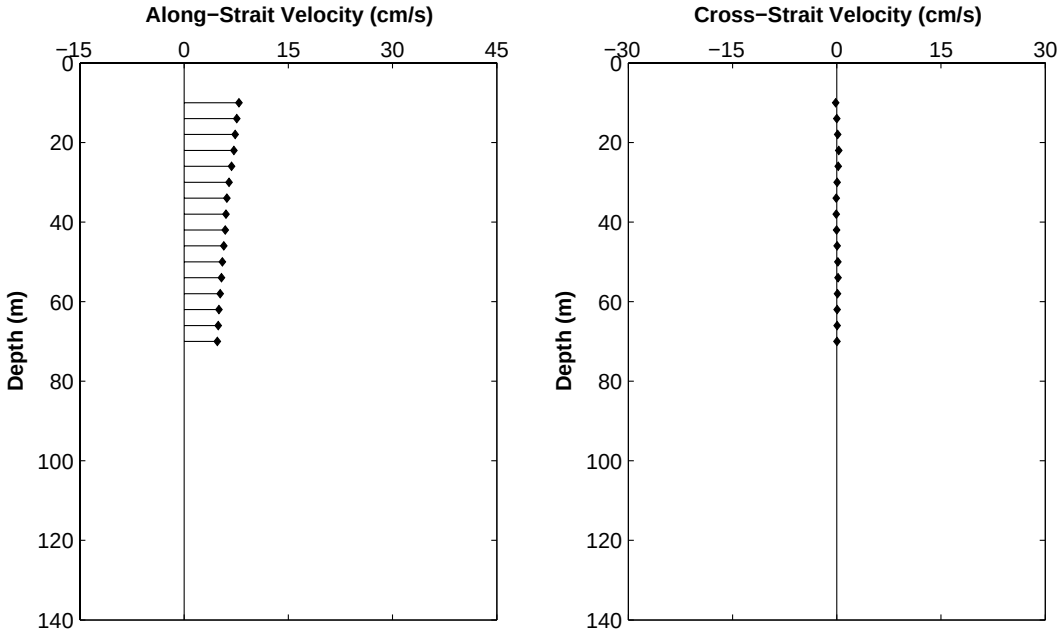


Figure 37: Mean Flows, Early Summer: June 2003 to August 2003

Central Barrow Strait



North side of Barrow Strait

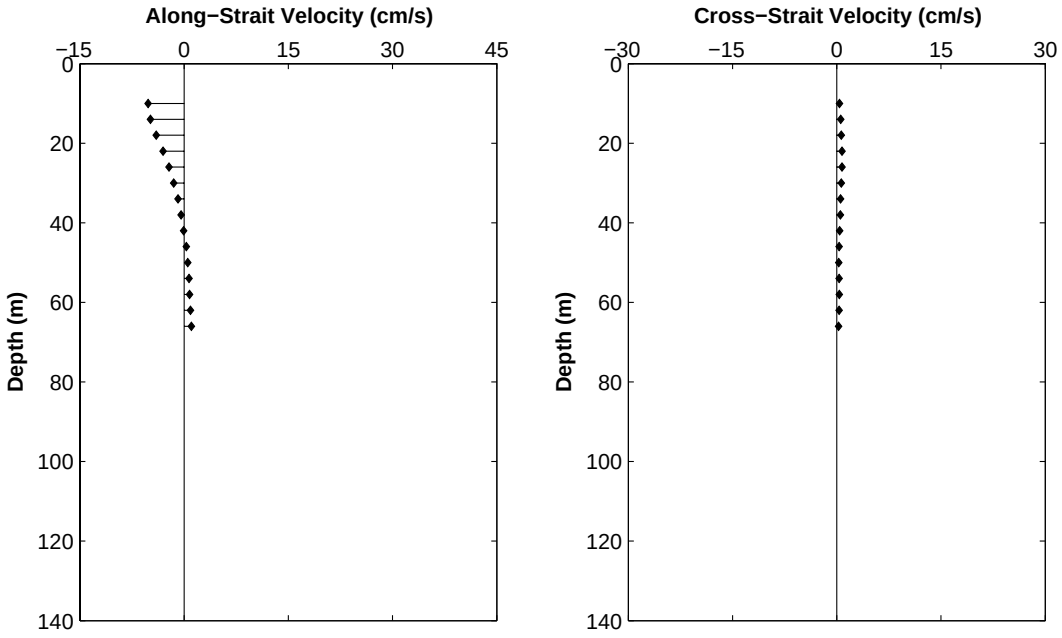
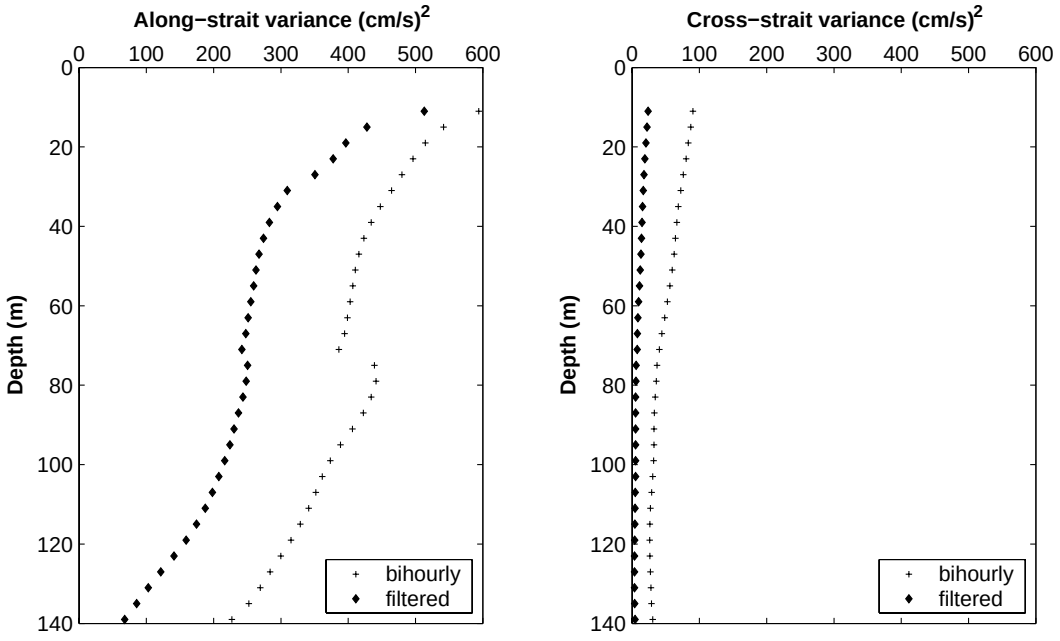


Figure 38: Variance in bihourly and low-pass filtered currents August 2002 to August 2003

South side of Barrow Strait



South−central Barrow Strait

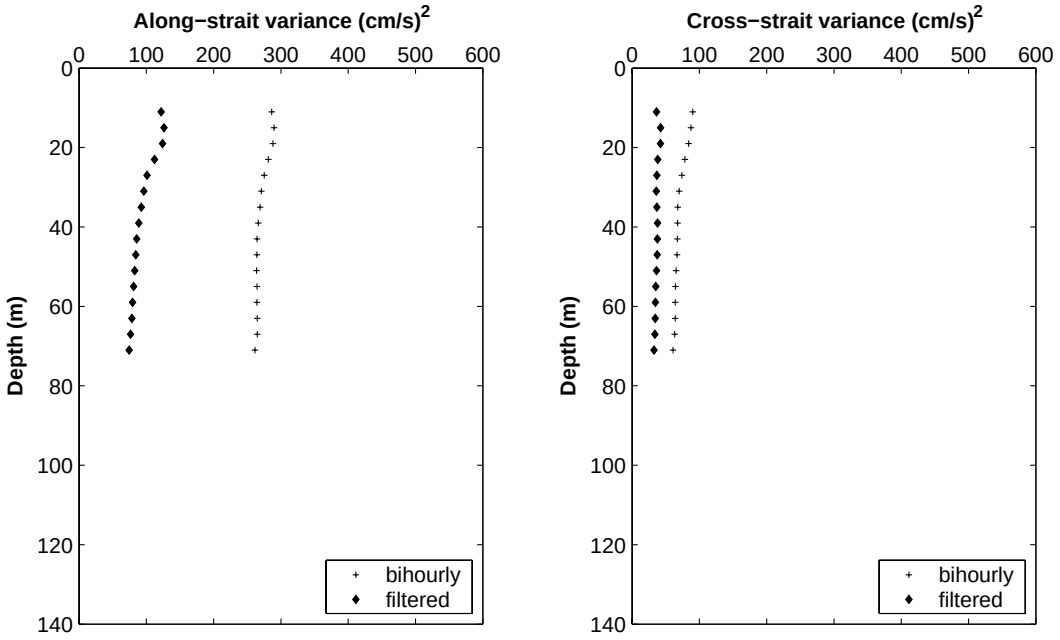
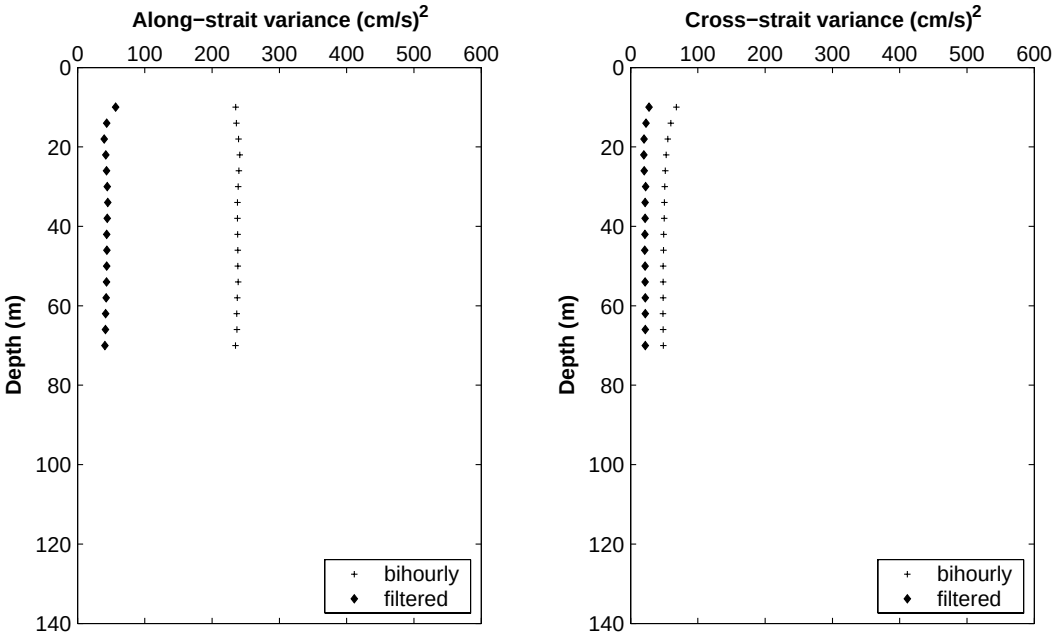


Figure 38: Variance in bihourly and low-pass filtered currents August 2002 to August 2003

Central Barrow Strait



North side of Barrow Strait

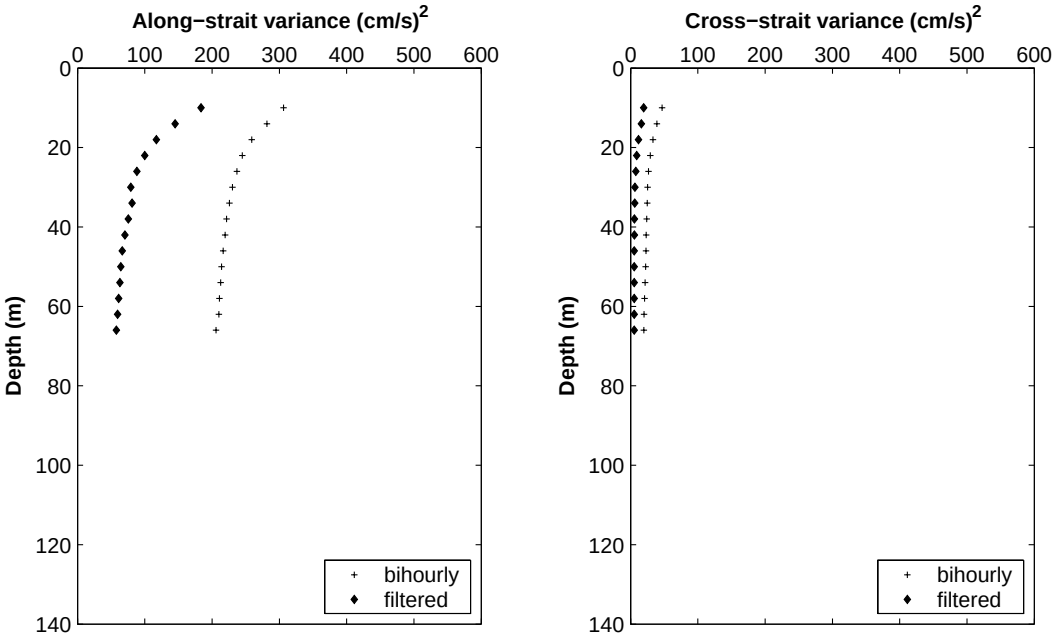
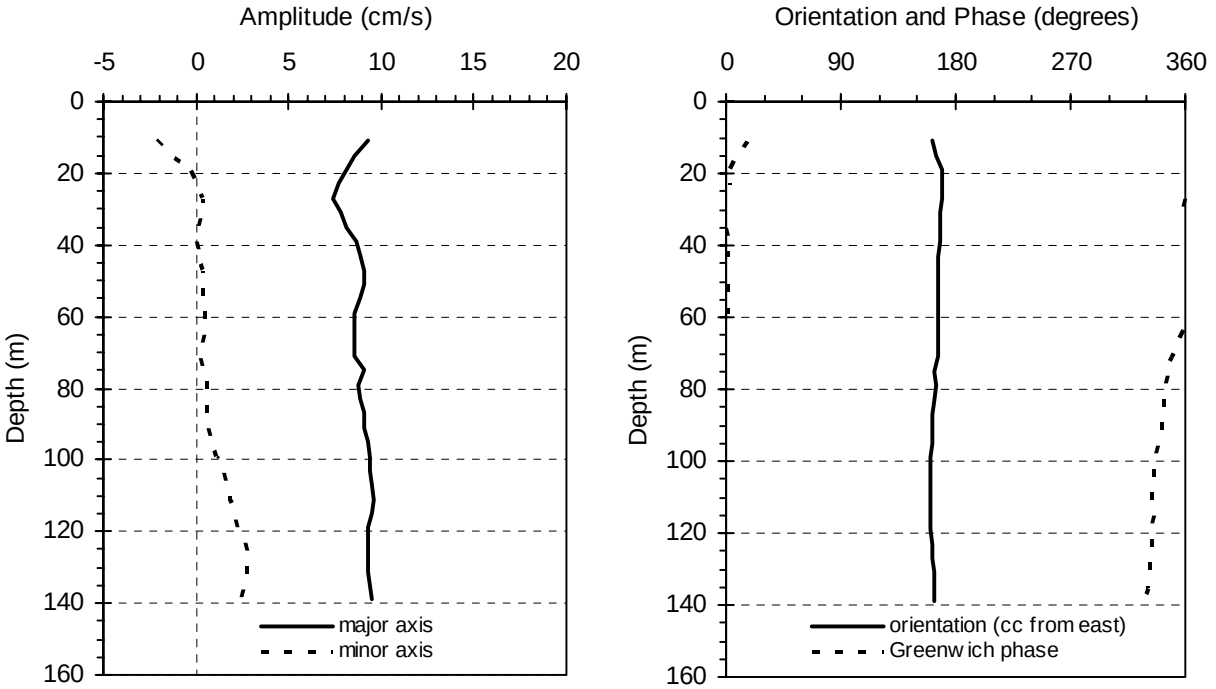


Figure 39 – K1 Tidal Constituent, South Side Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Nov. 09, 2002):



For Solid Ice Period (Jan. 24, 2003 to Mar .15, 2003):

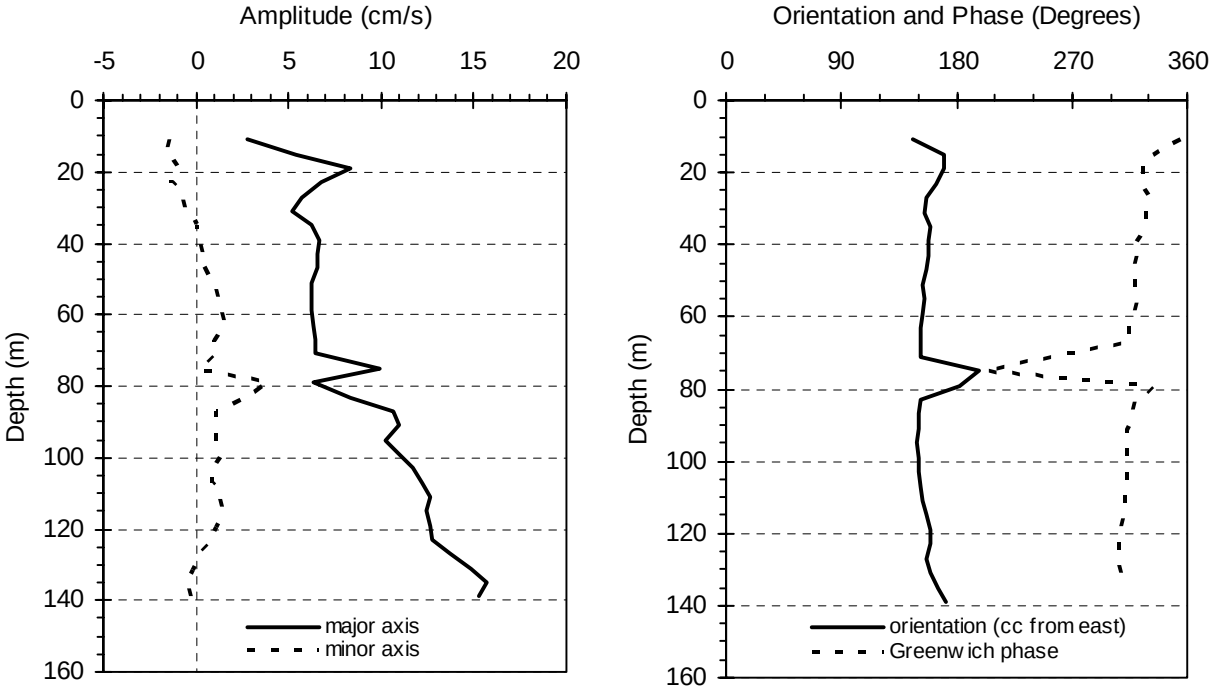
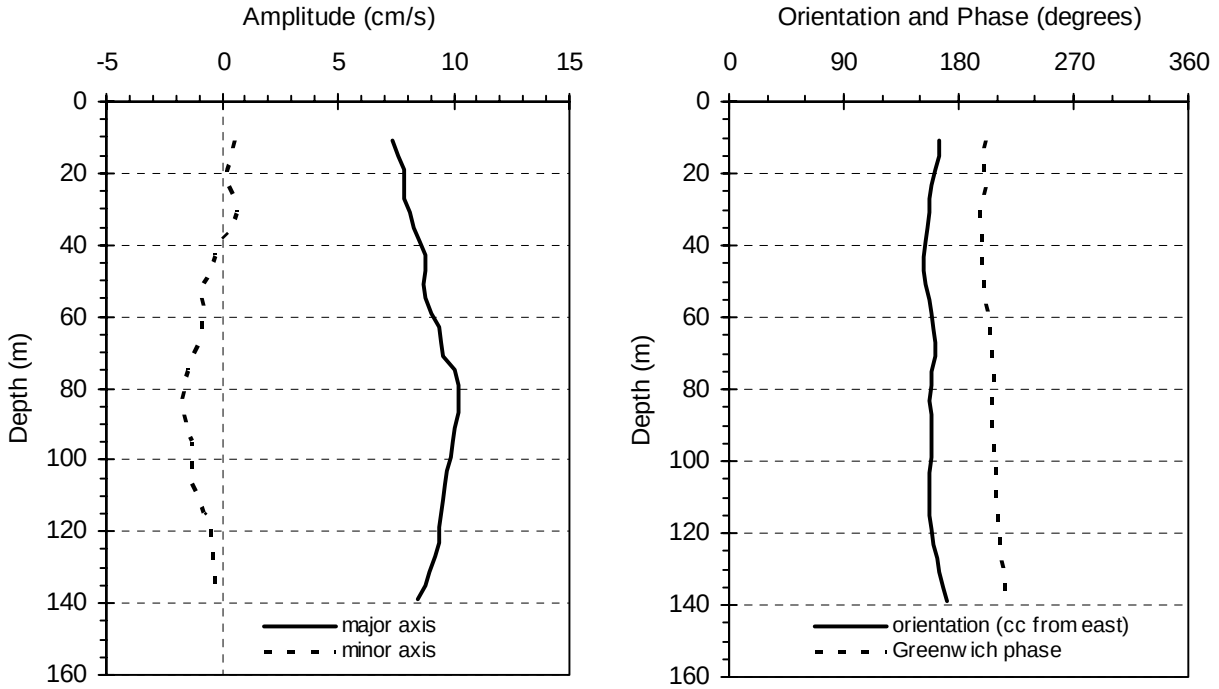


Figure 40 – M2 Tidal Constituent, South Side Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Nov. 09, 2002):



For Solid Ice Period (Jan. 24, 2003 to Mar. 15, 2003):

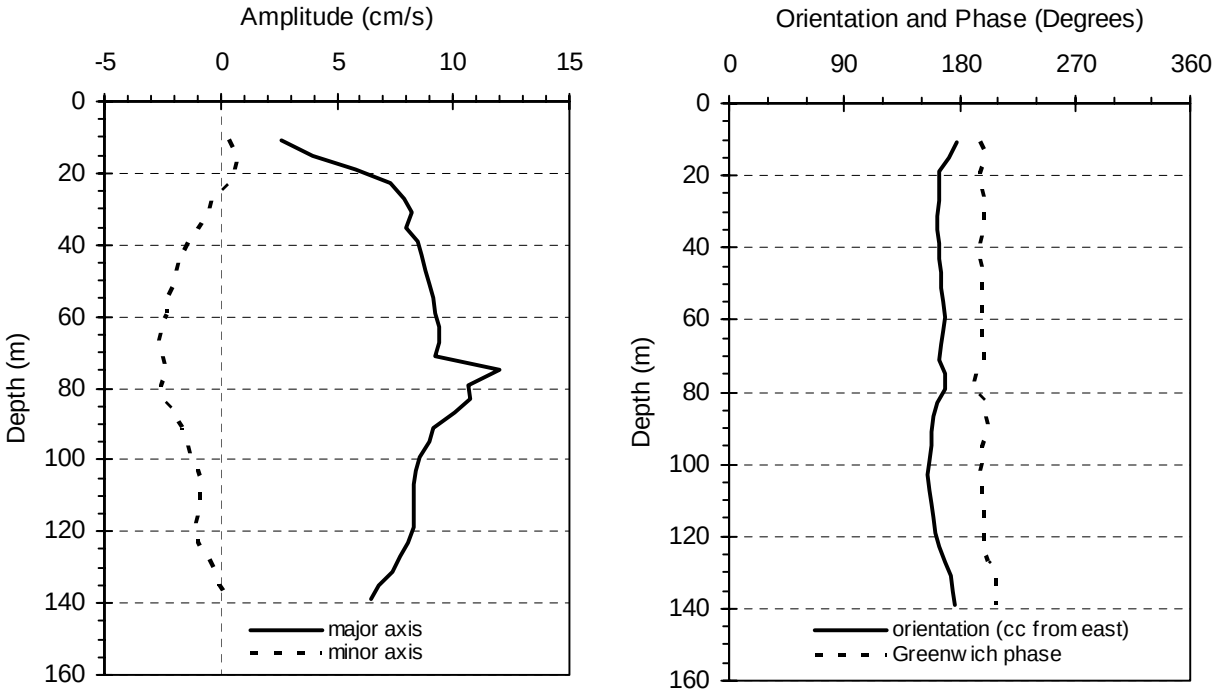
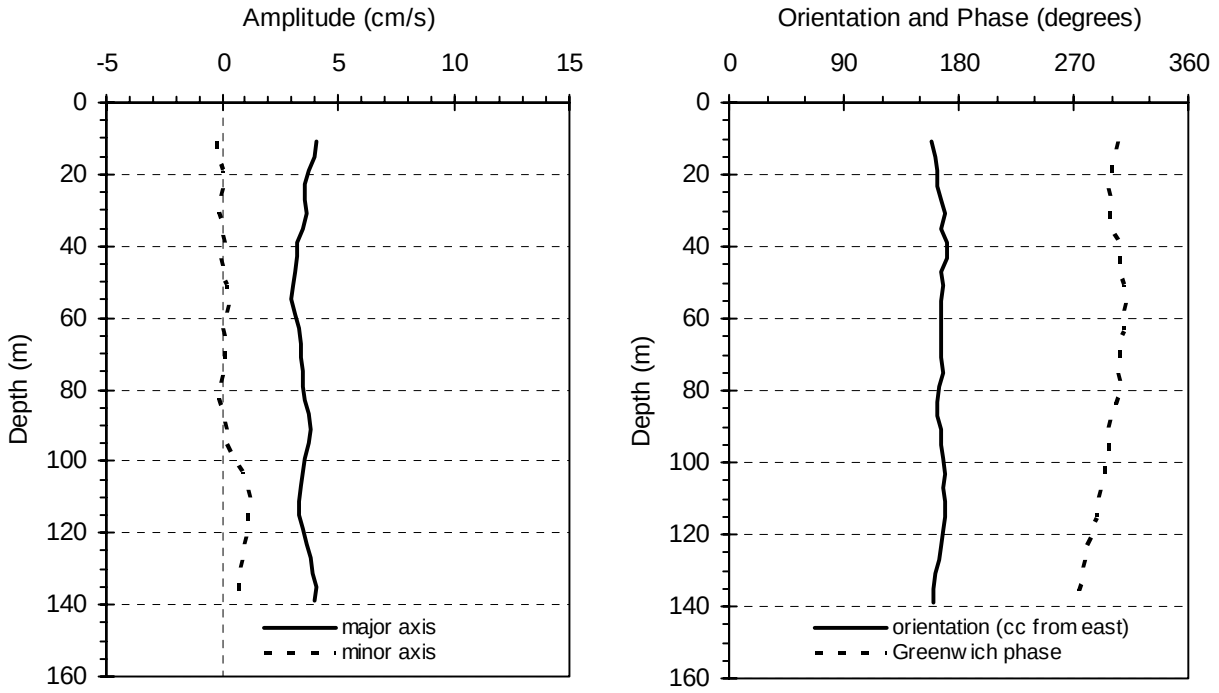


Figure 41 – O1 Tidal Constituent, South Side Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Nov. 09, 2002):



For Solid Ice Period (Jan. 24, 2003 to Mar. 15, 2003):

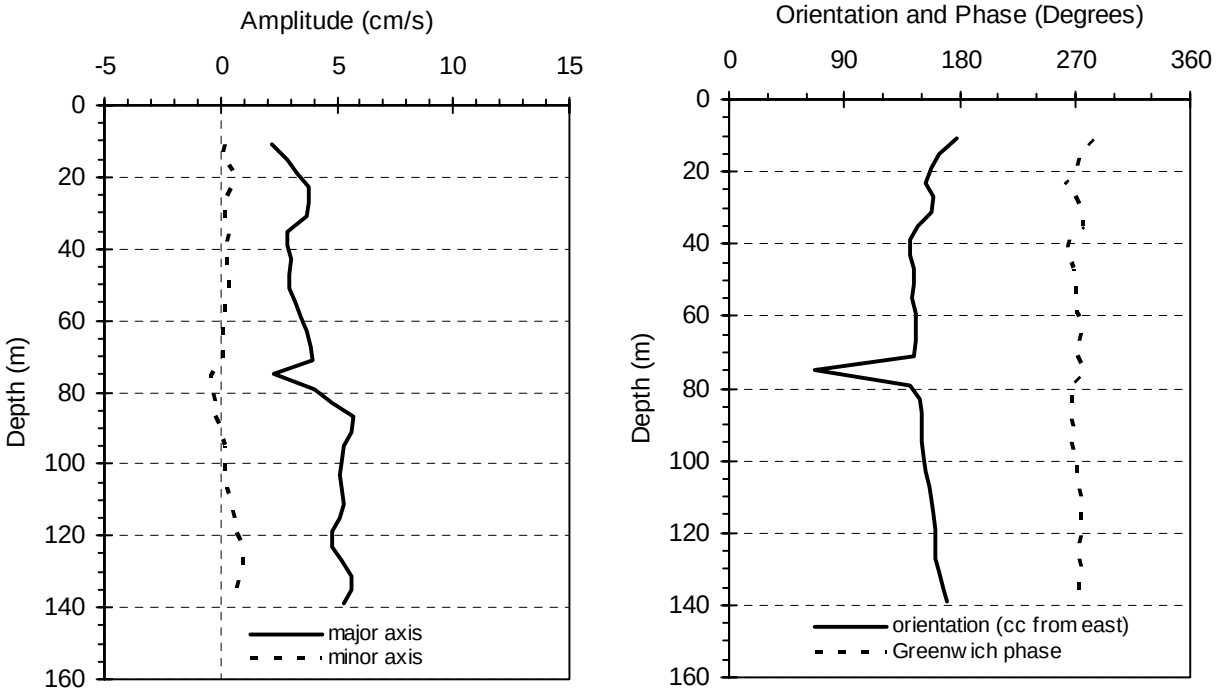
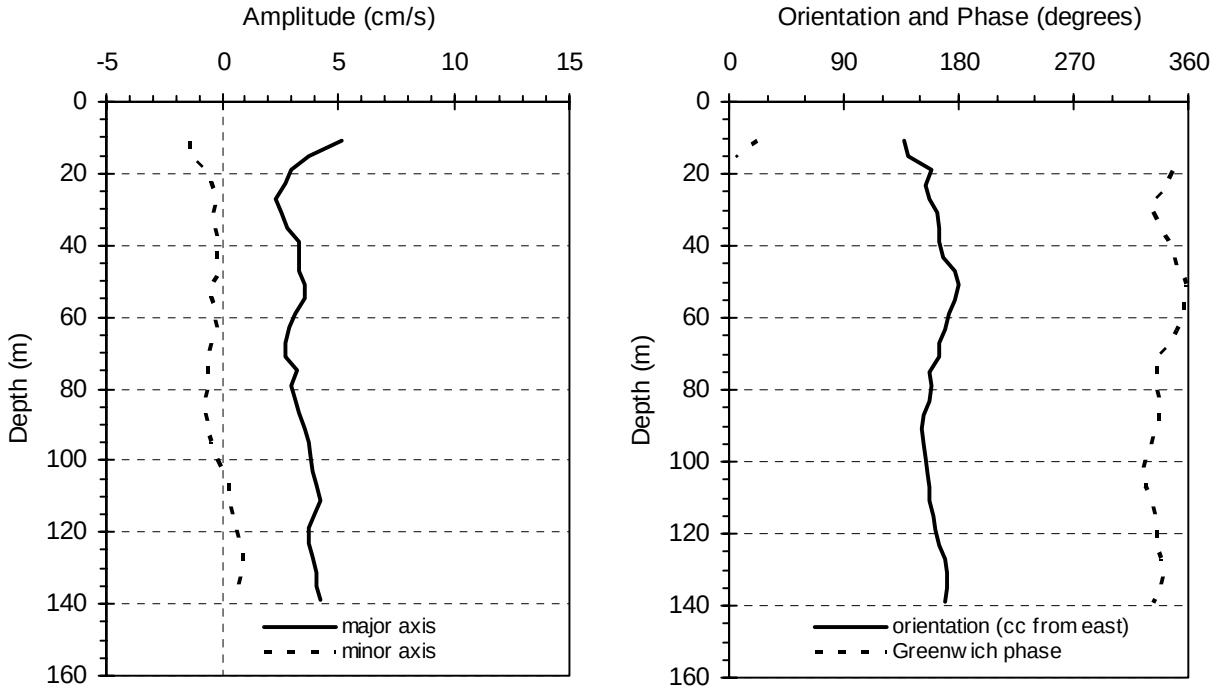


Figure 42 – P1 Tidal Constituent, South Side Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Nov. 09, 2002):



For Solid Ice Period (Jan. 24, 2003 to Mar. 15, 2003):

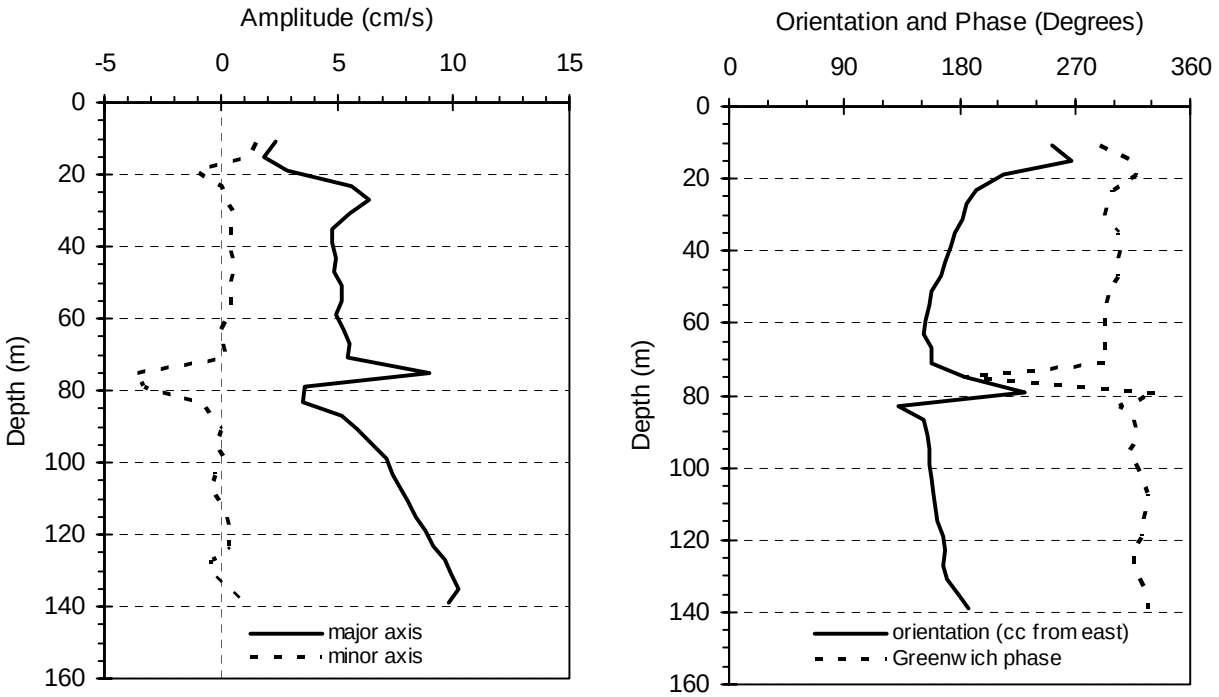
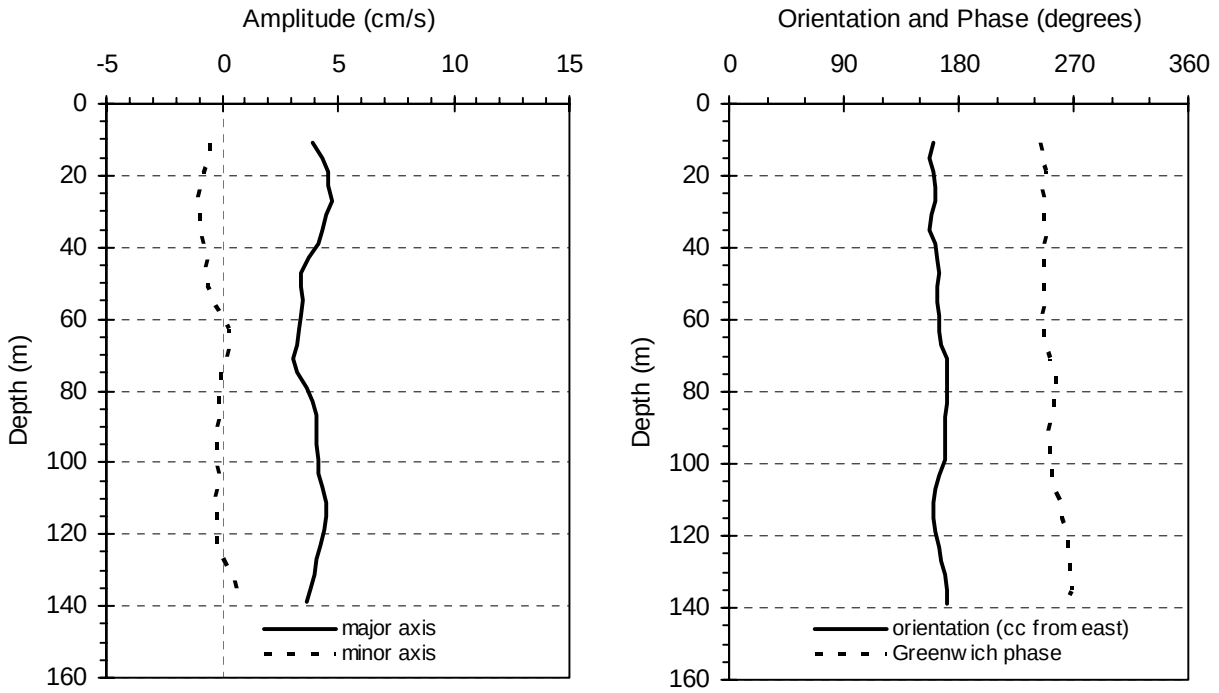


Figure 43 – S2 Tidal Constituent, South Side Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Nov. 09, 2002):



For Solid Ice Period (Jan. 24, 2003 to Mar. 15, 2003):

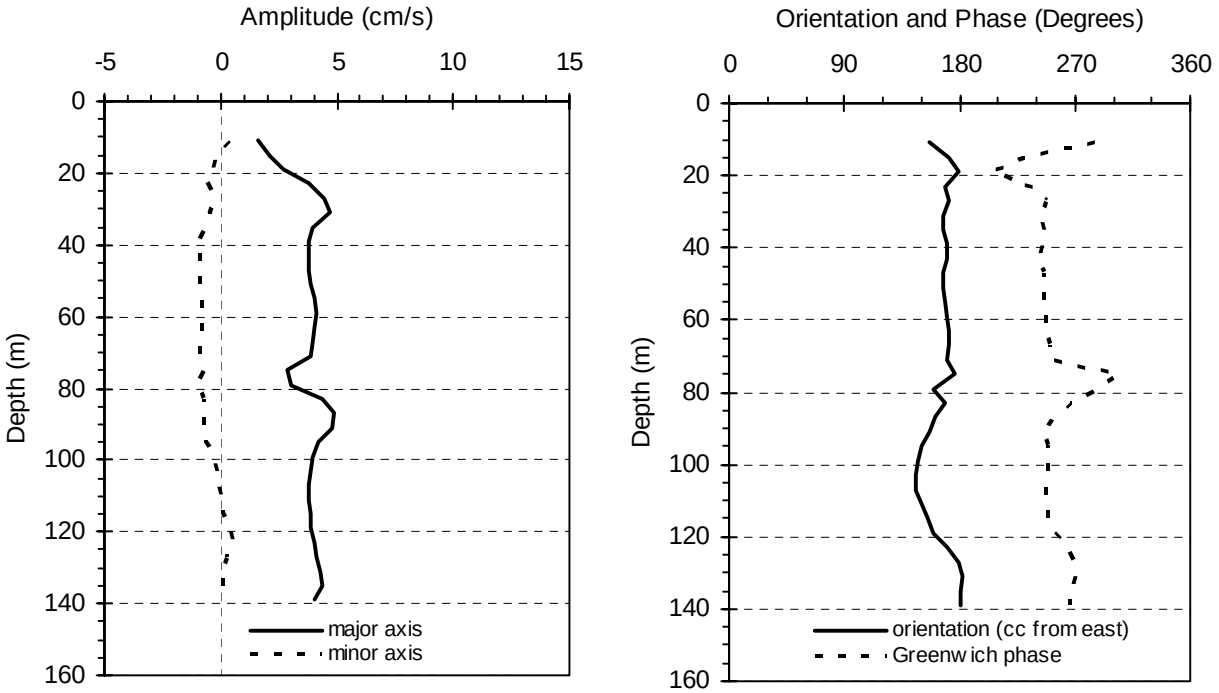
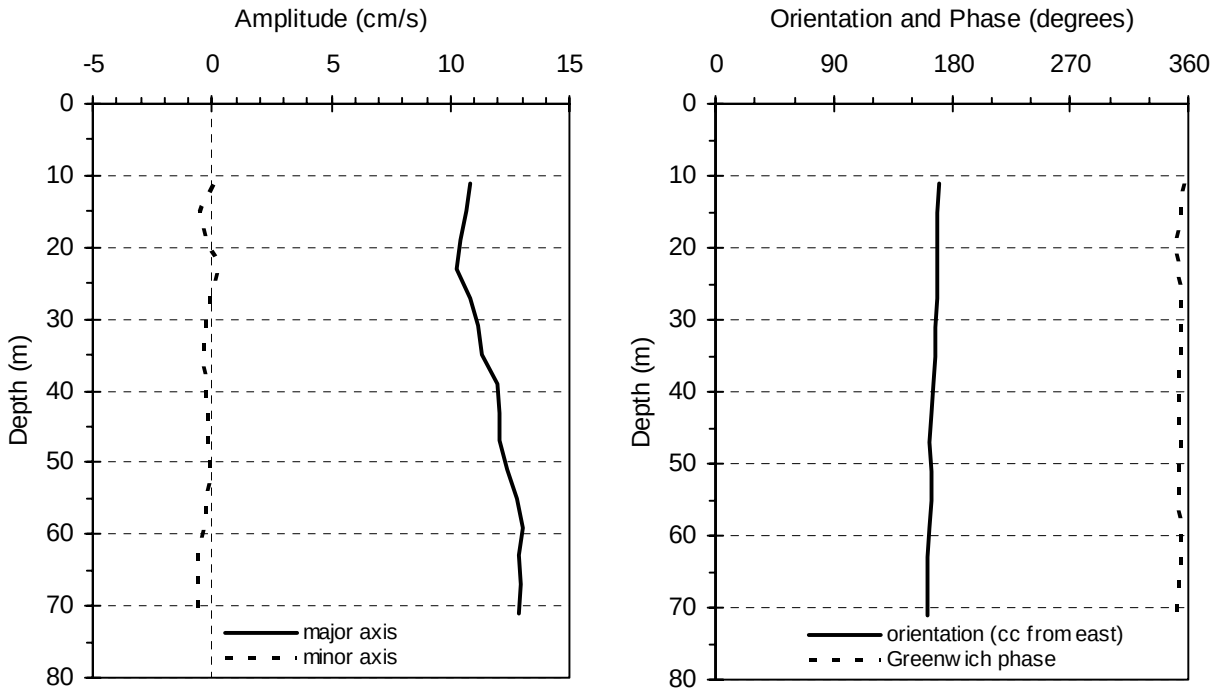


Figure 44 – K1 Tidal Constituent, South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 25, 2002):



For Solid Ice Period (Feb. 7, 2003 to Mar. 15, 2003):

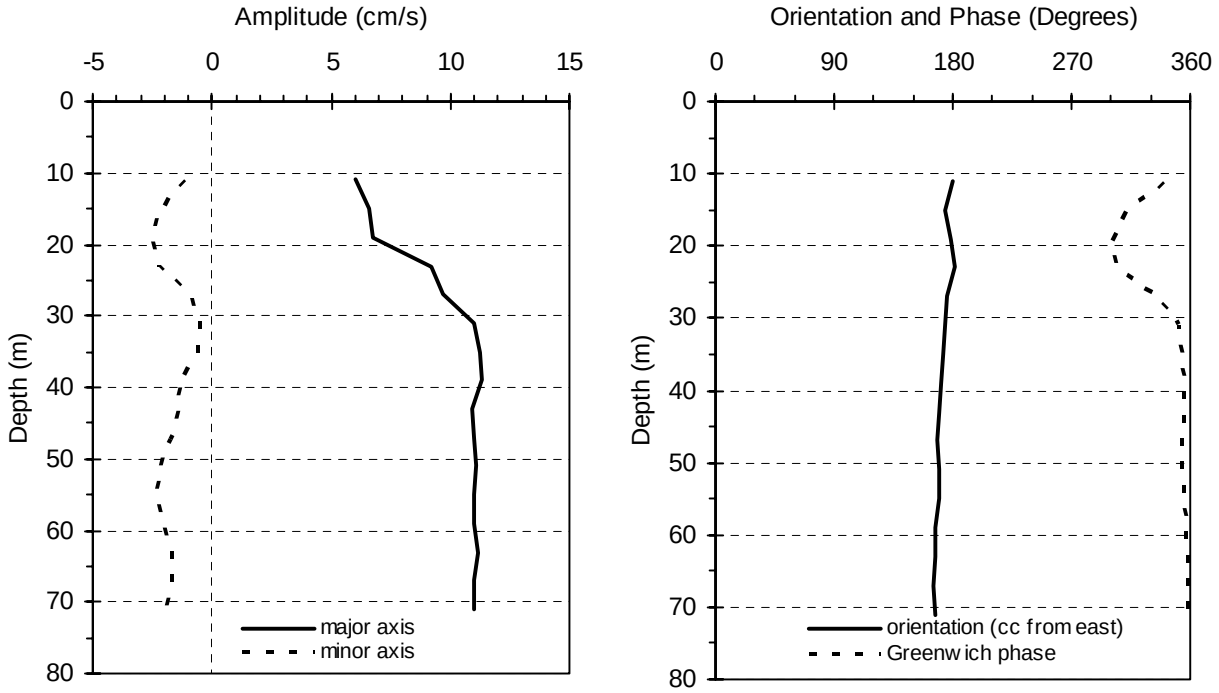
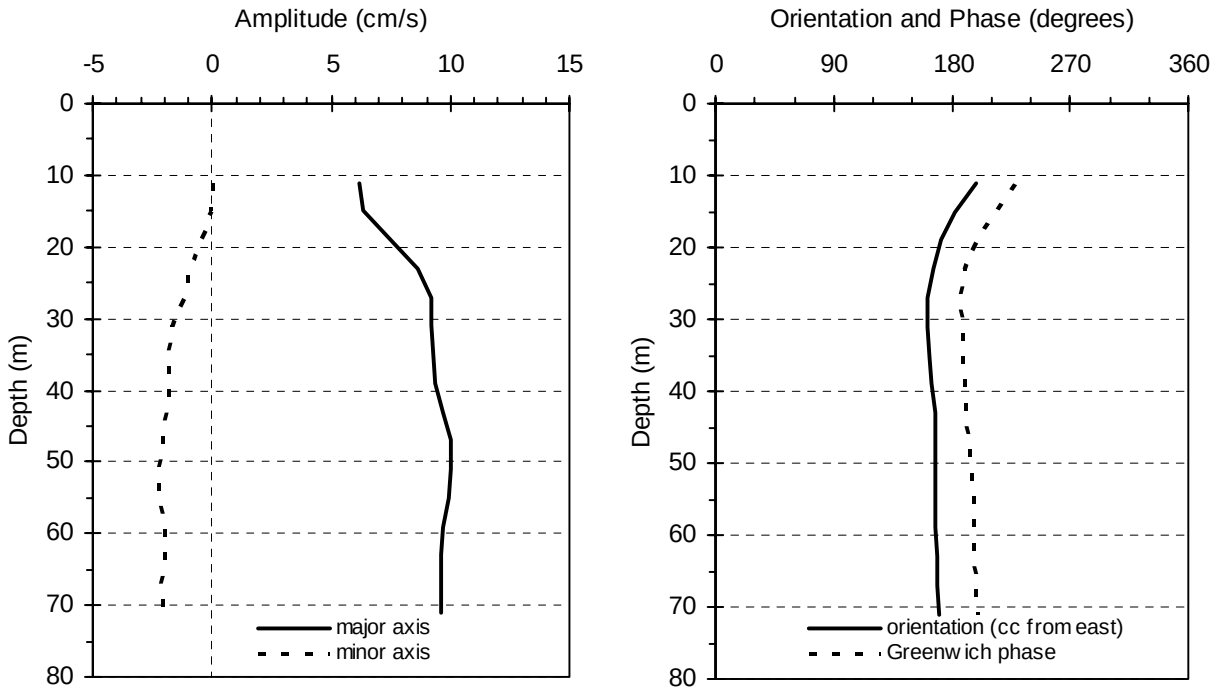


Figure 45 – M2 Tidal Constituent, South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 25, 2002):



For Solid Ice Period (Feb. 7, 2003 to Mar. 15, 2003):

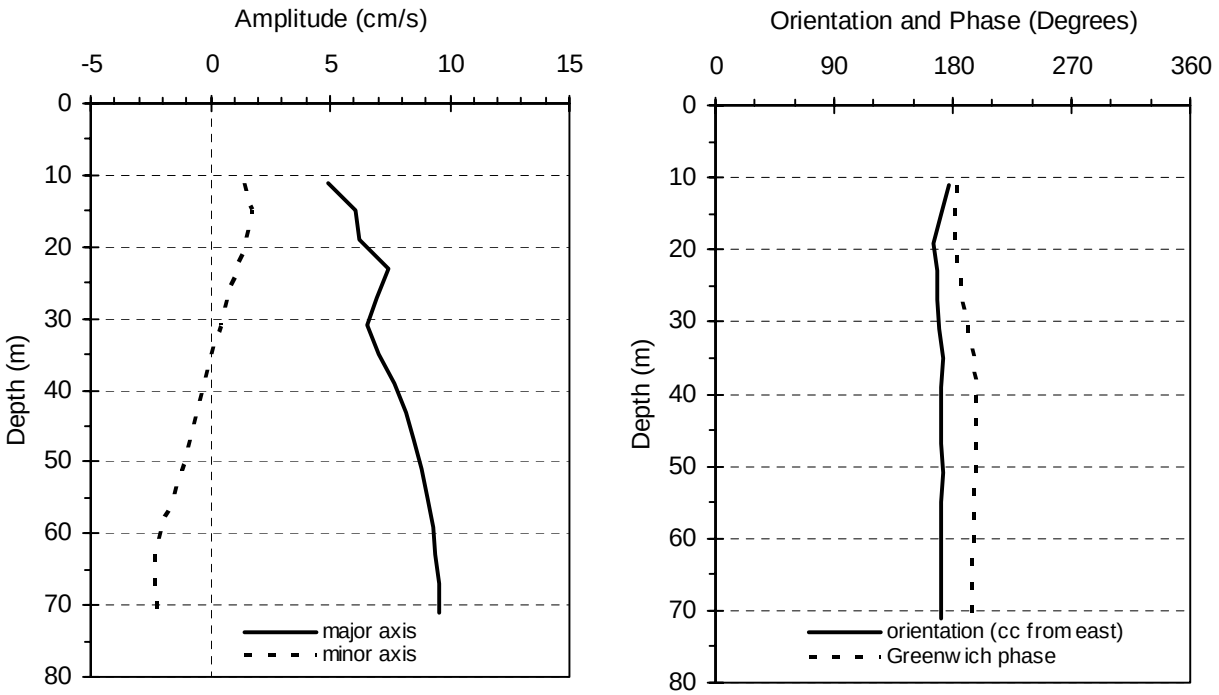
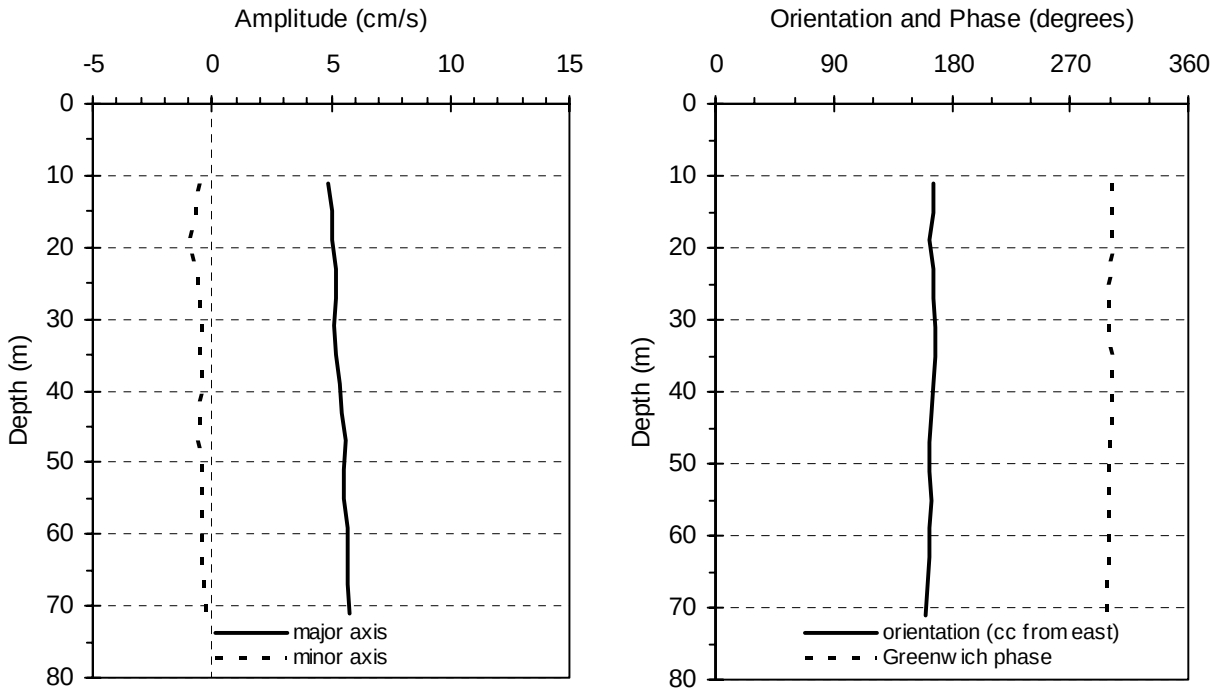


Figure 46 – O1 Tidal Constituent, South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 25, 2002):



For Solid Ice Period (Feb. 7, 2003 to Mar. 15, 2003):

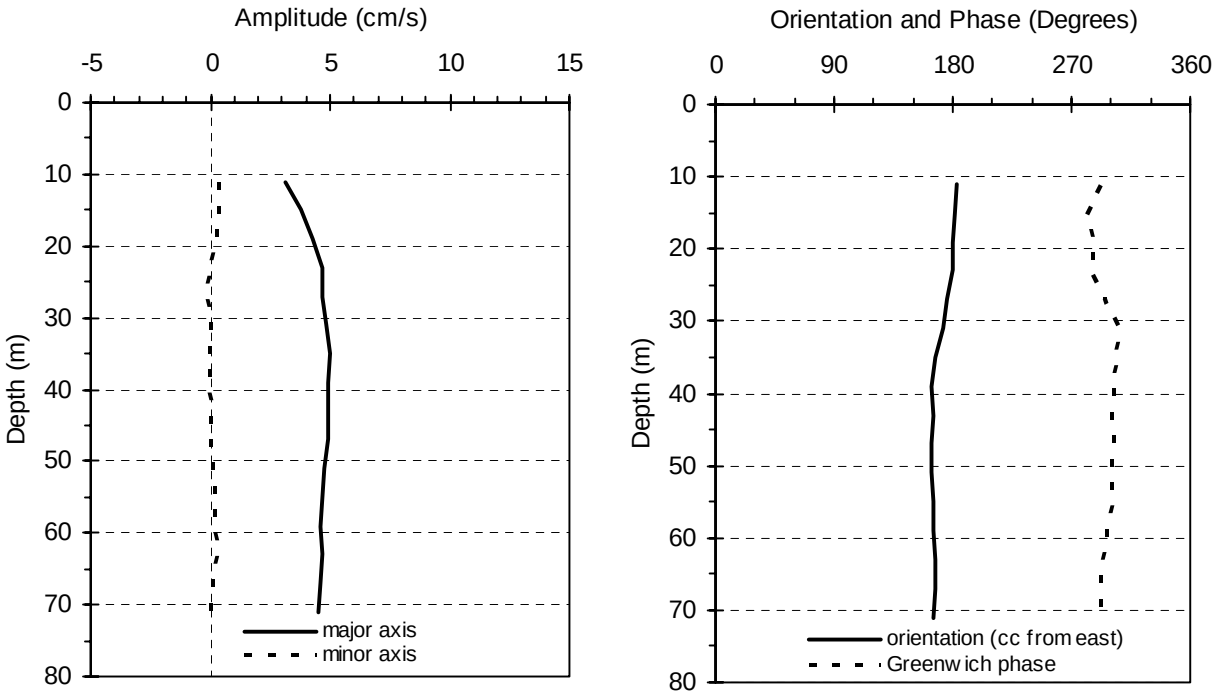
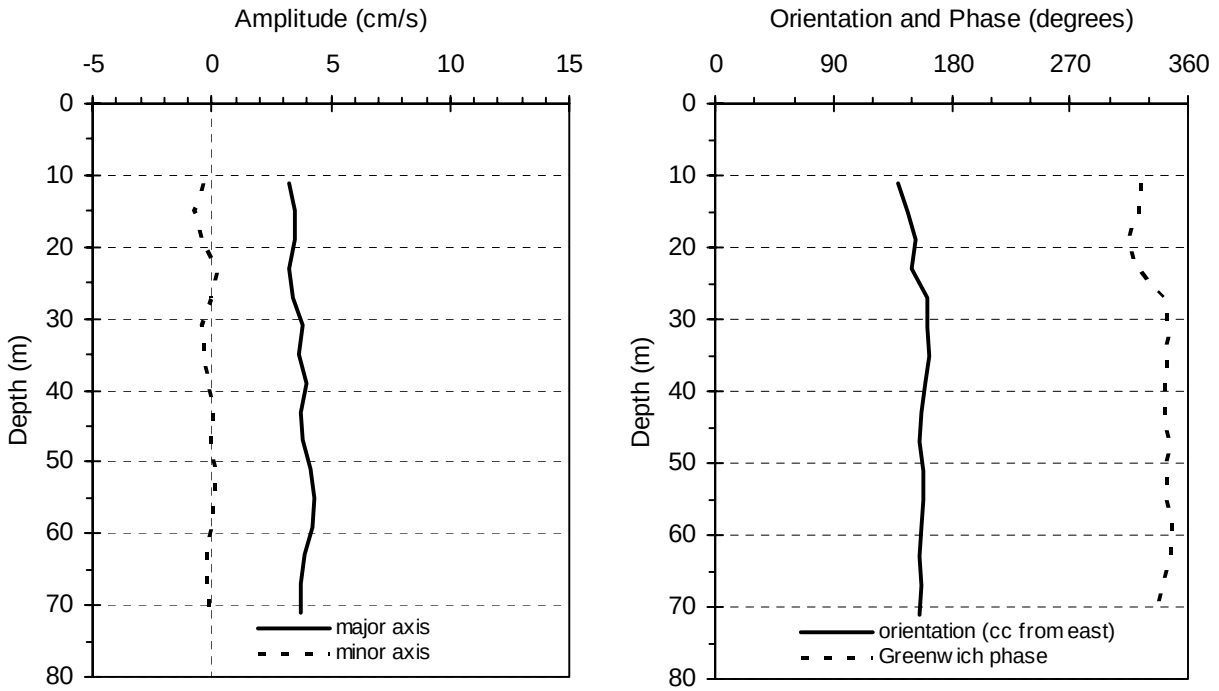


Figure 47 – P1 Tidal Constituent, South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 25, 2002):



For Solid Ice Period (Feb. 7, 2003 to Mar. 15, 2003):

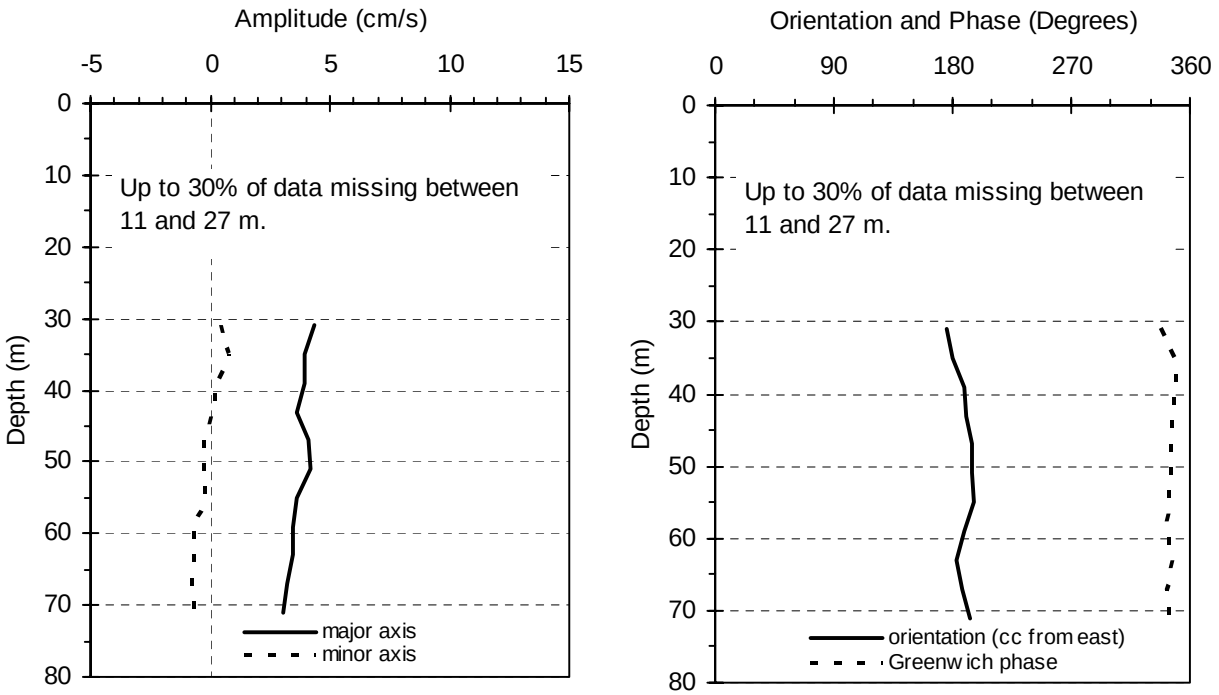
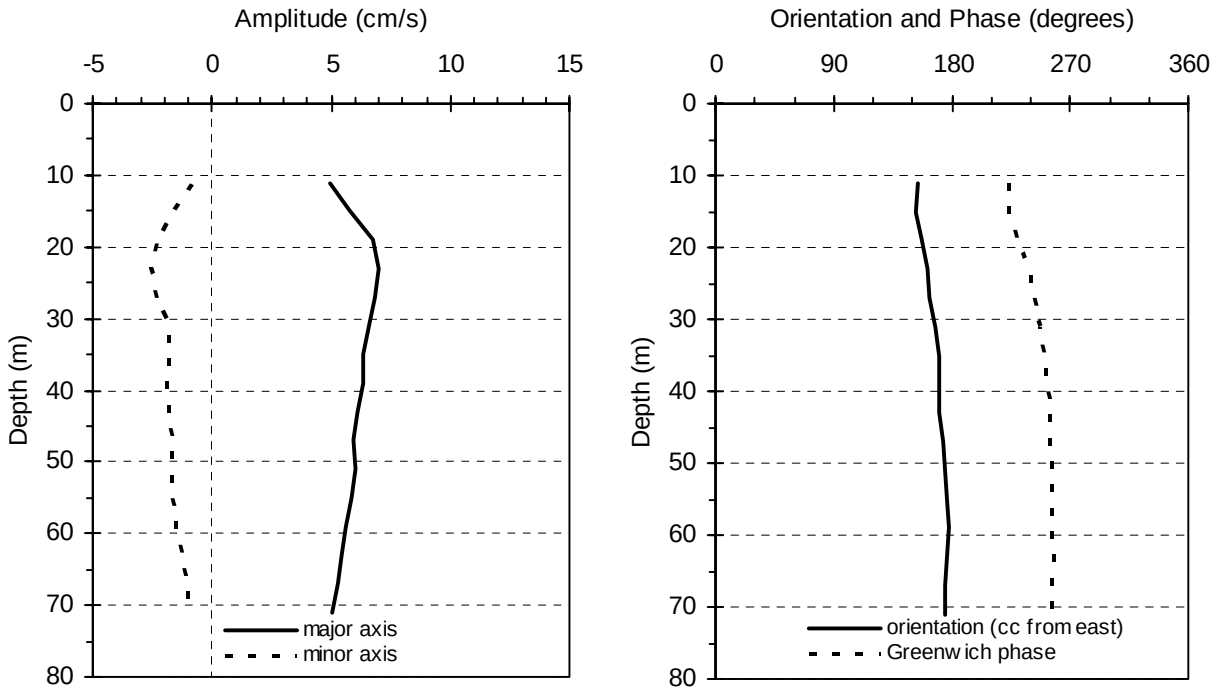


Figure 48 – S2 Tidal Constituent, South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 25, 2002):



For Solid Ice Period (Feb. 07, 2003 to Mar. 15, 2003):

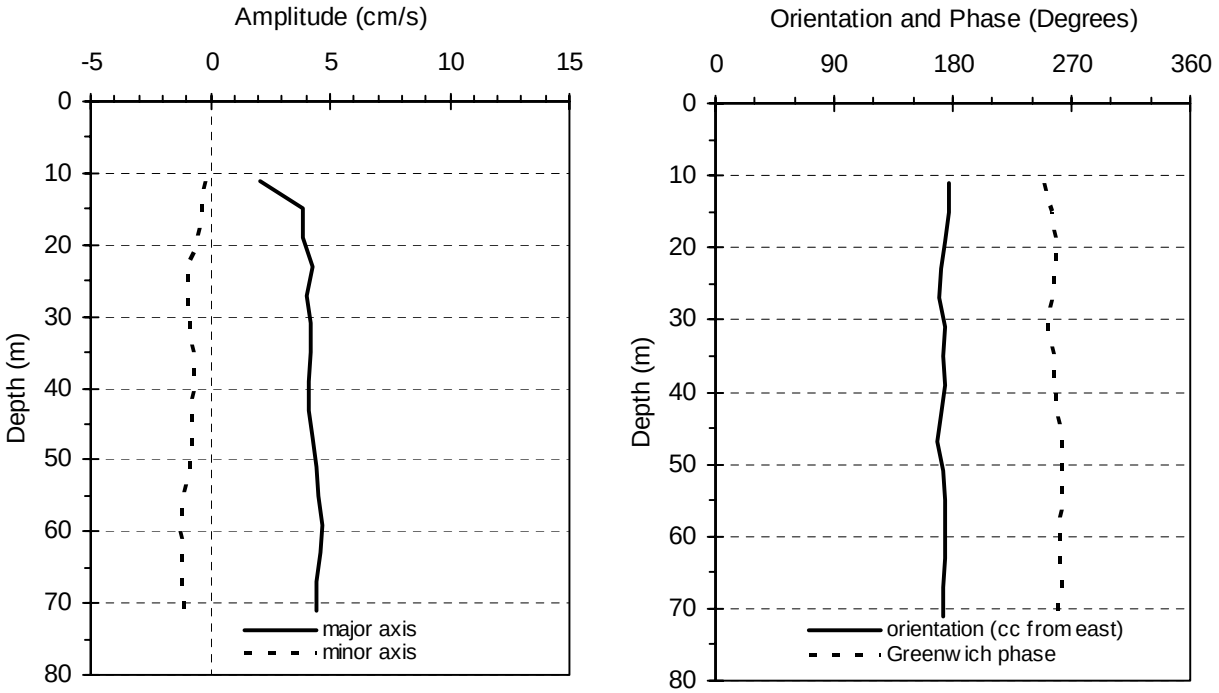
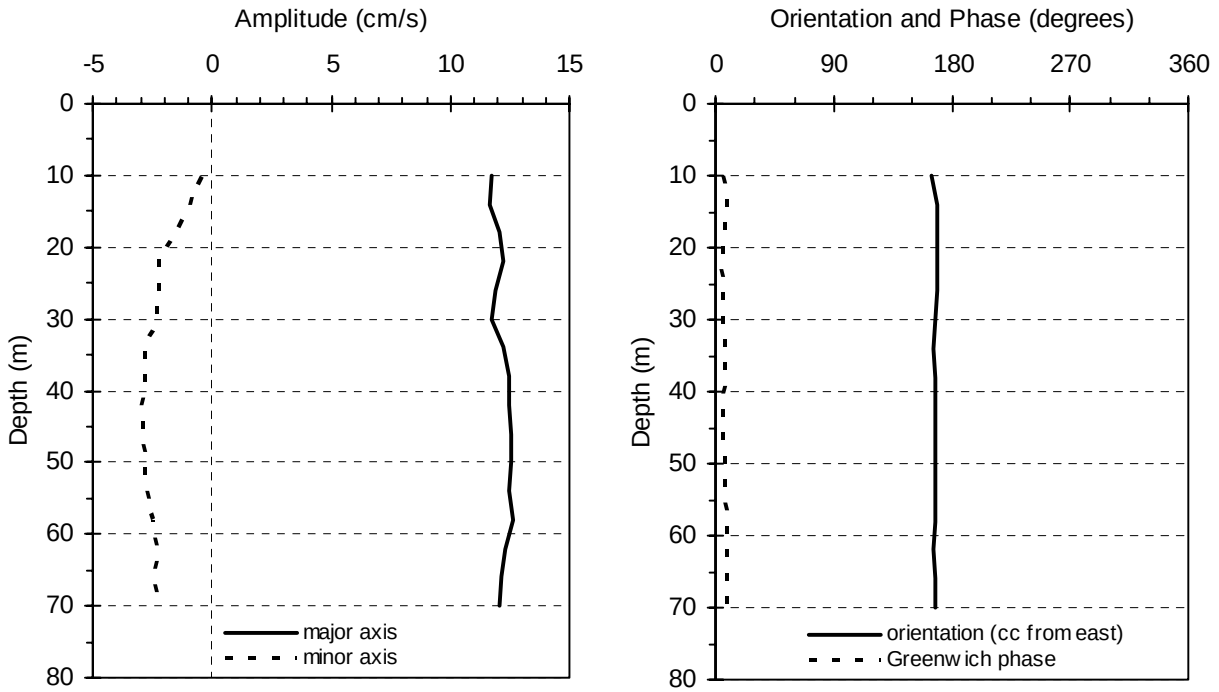


Figure 49 – K1 Tidal Constituent, Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 23, 2002):



For Solid Ice Period (Feb. 24, 2003 to Mar. 15, 2003):

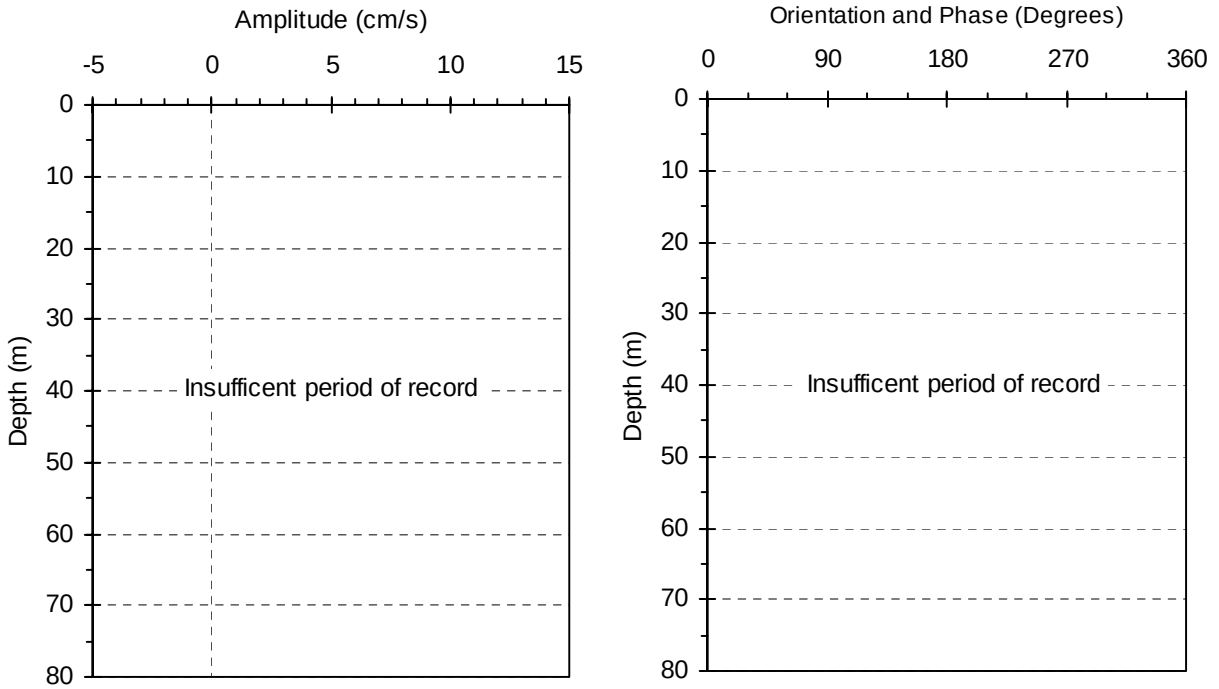
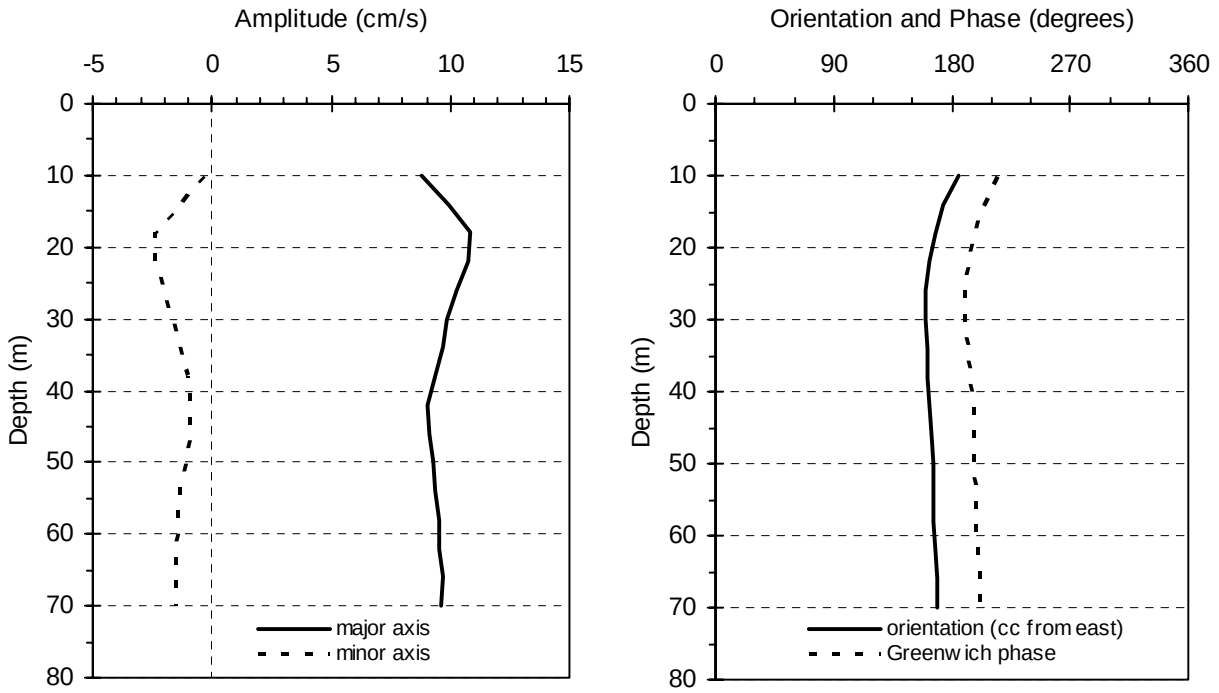


Figure 50 – M2 Tidal Constituent, Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 23, 2002):



For Solid Ice Period (Feb. 24, 2003 to Mar. 15, 2003):

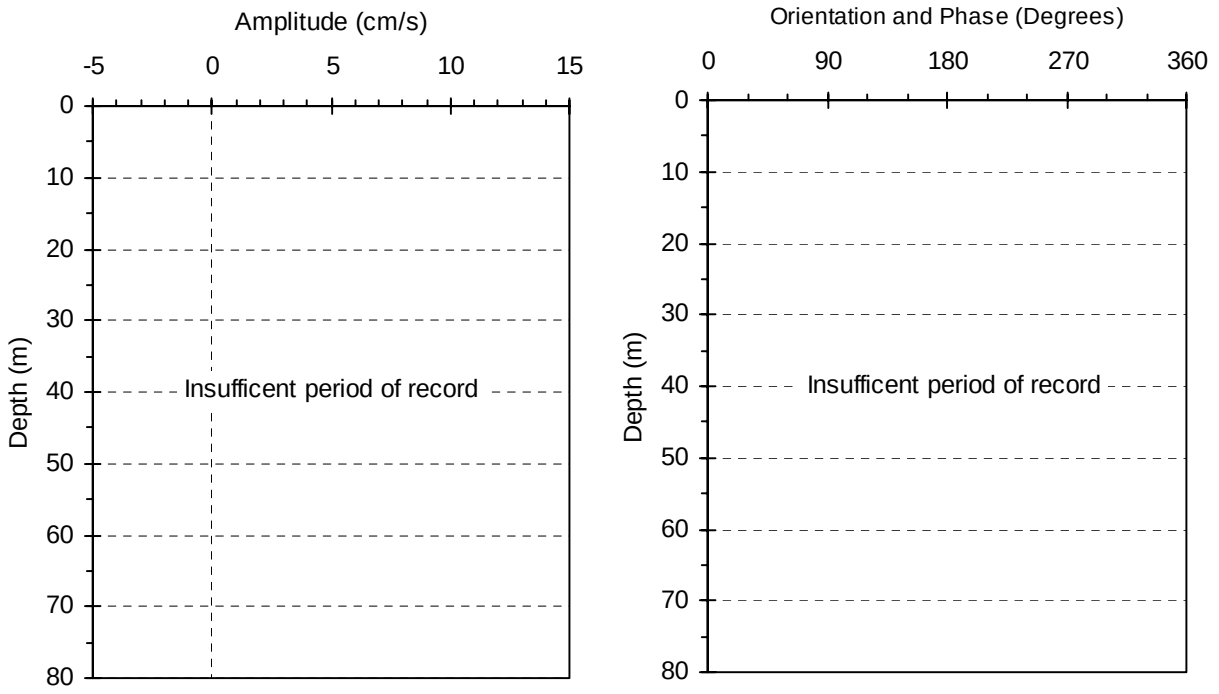
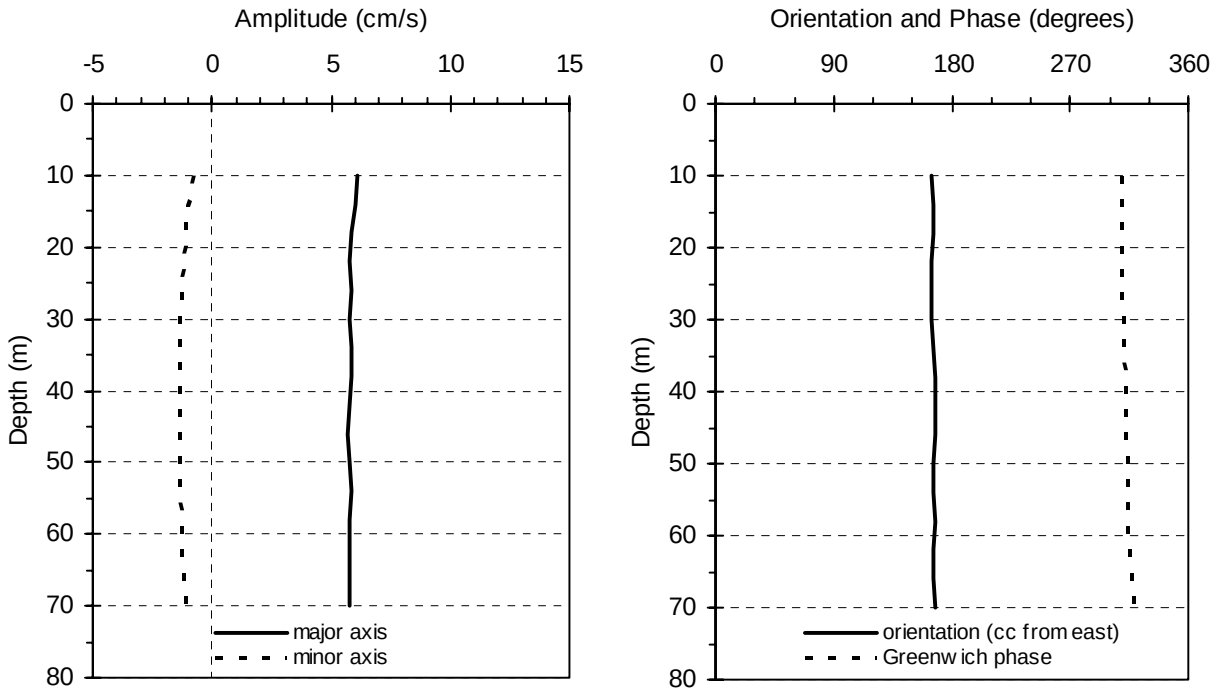


Figure 51 – O1 Tidal Constituent, Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 23, 2002):



For Solid Ice Period (Feb. 24, 2003 to Mar. 15, 2003):

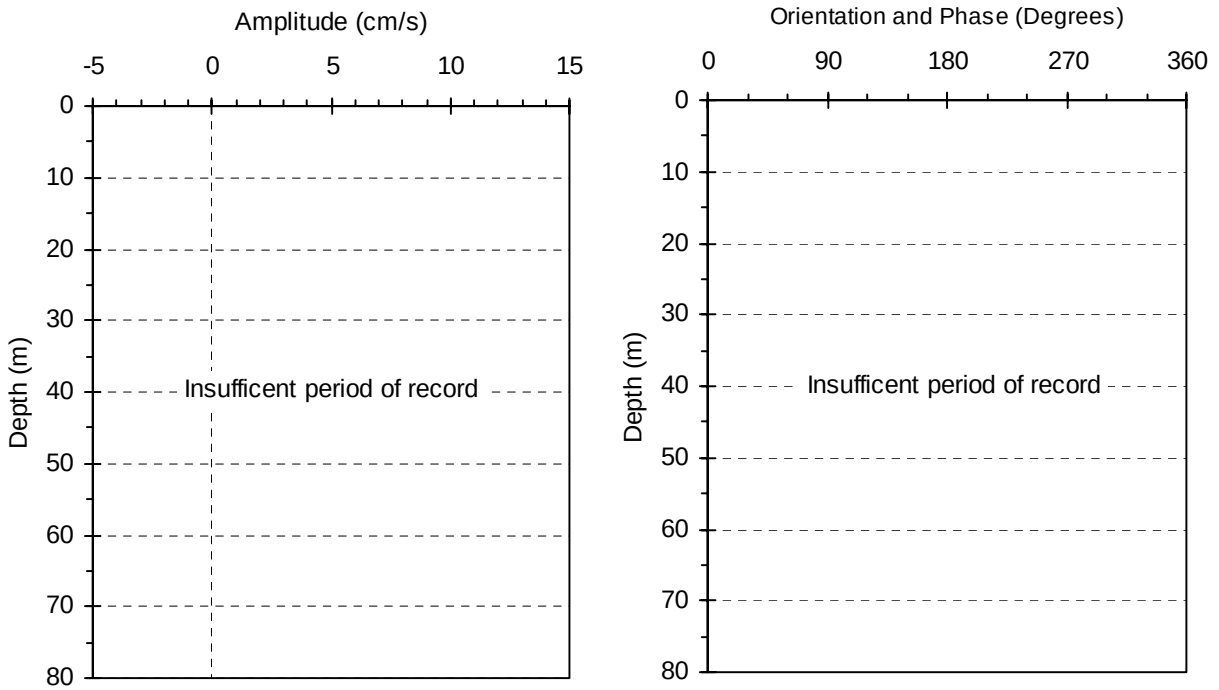
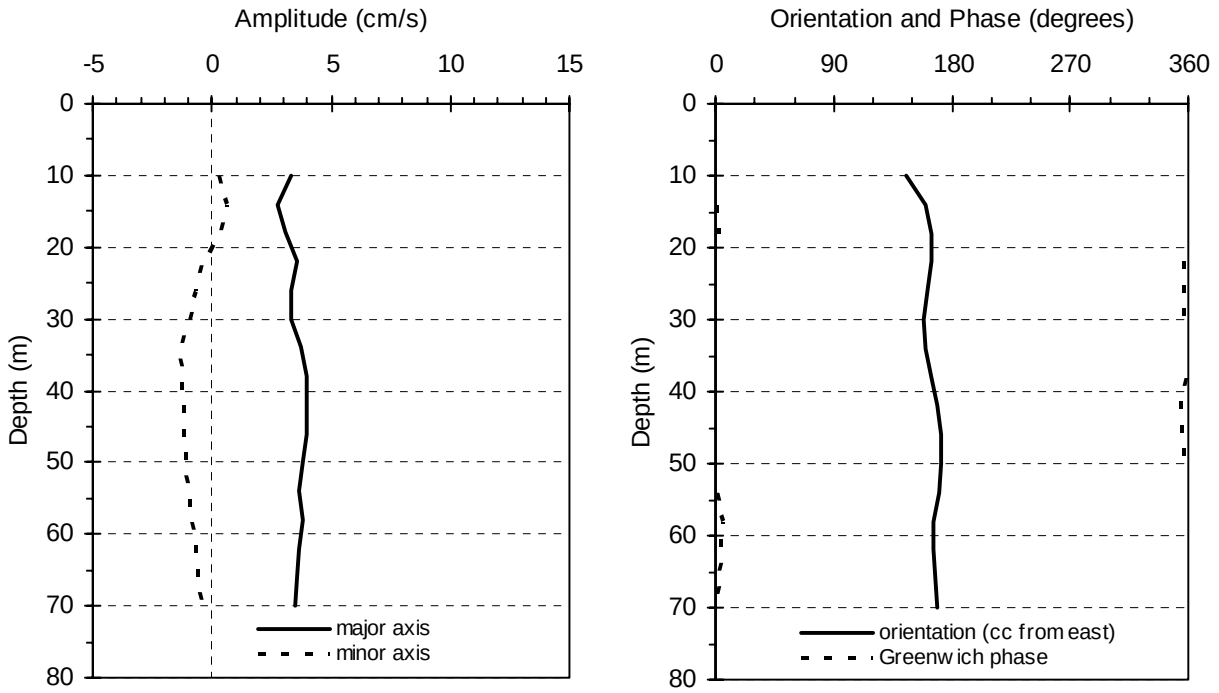


Figure 52 – P1 Tidal Constituent, Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 23, 2002):



For Solid Ice Period (Feb. 24, 2003 to Mar. 15, 2003):

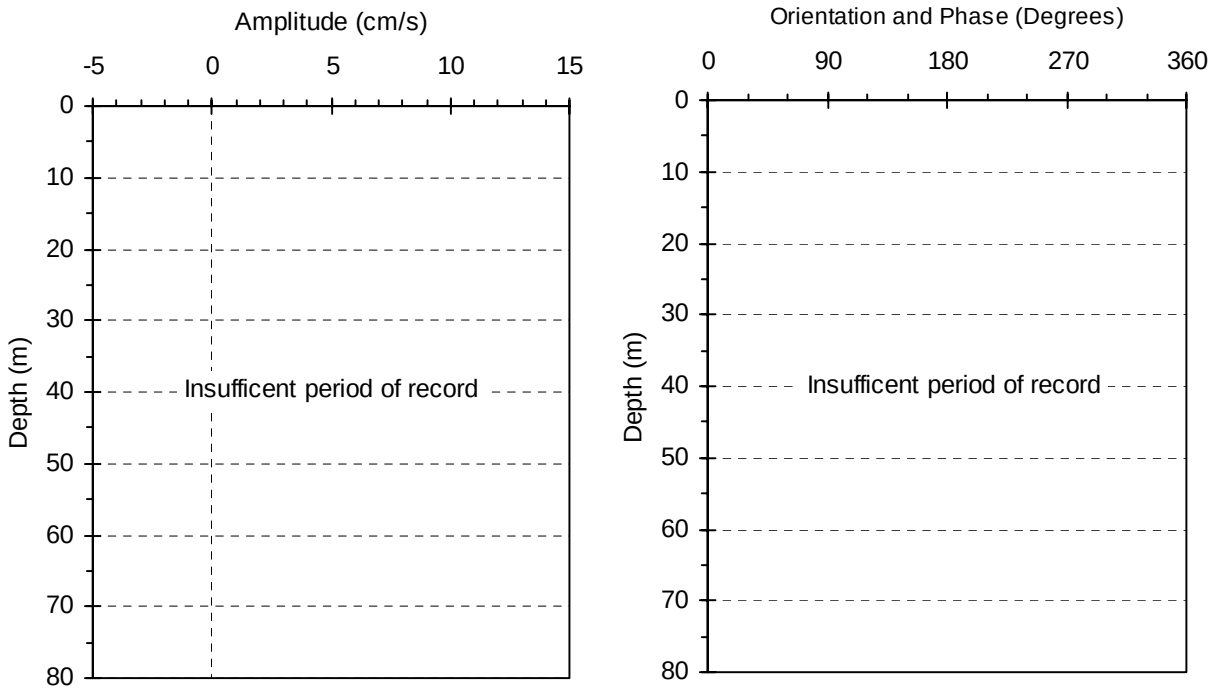
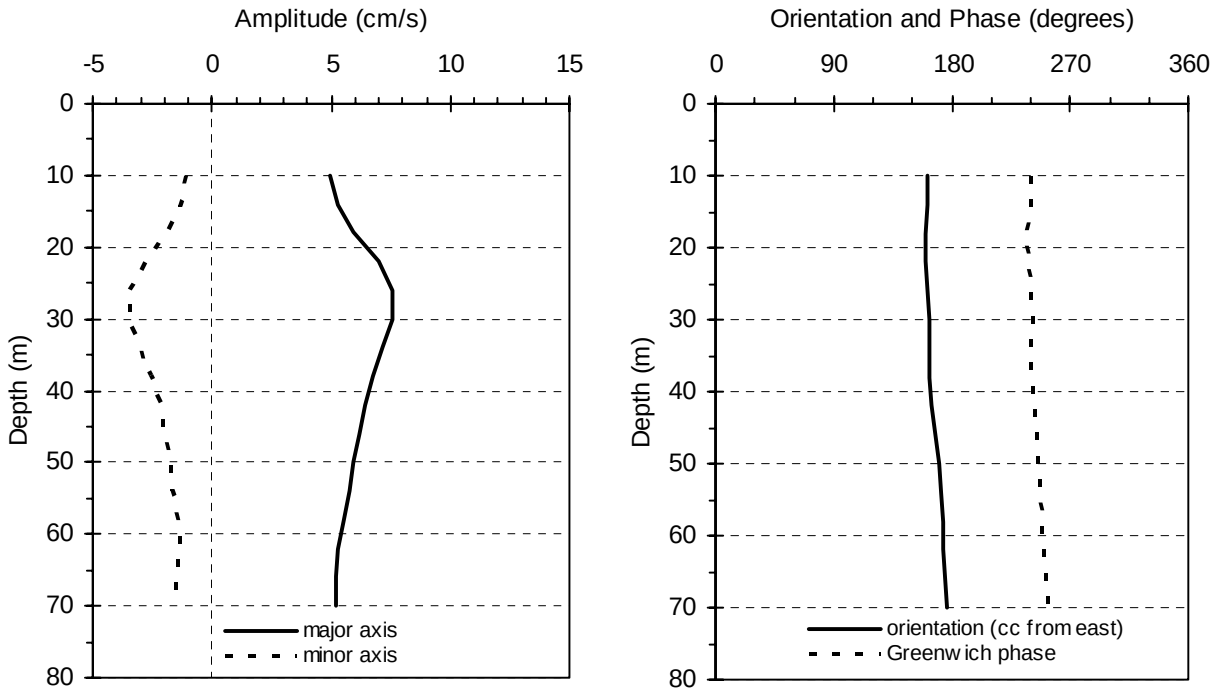


Figure 53 – S2 Tidal Constituent, Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 to Oct. 23, 2002):



For Solid Ice Period (Feb. 24, 2003 to Mar. 15, 2003):

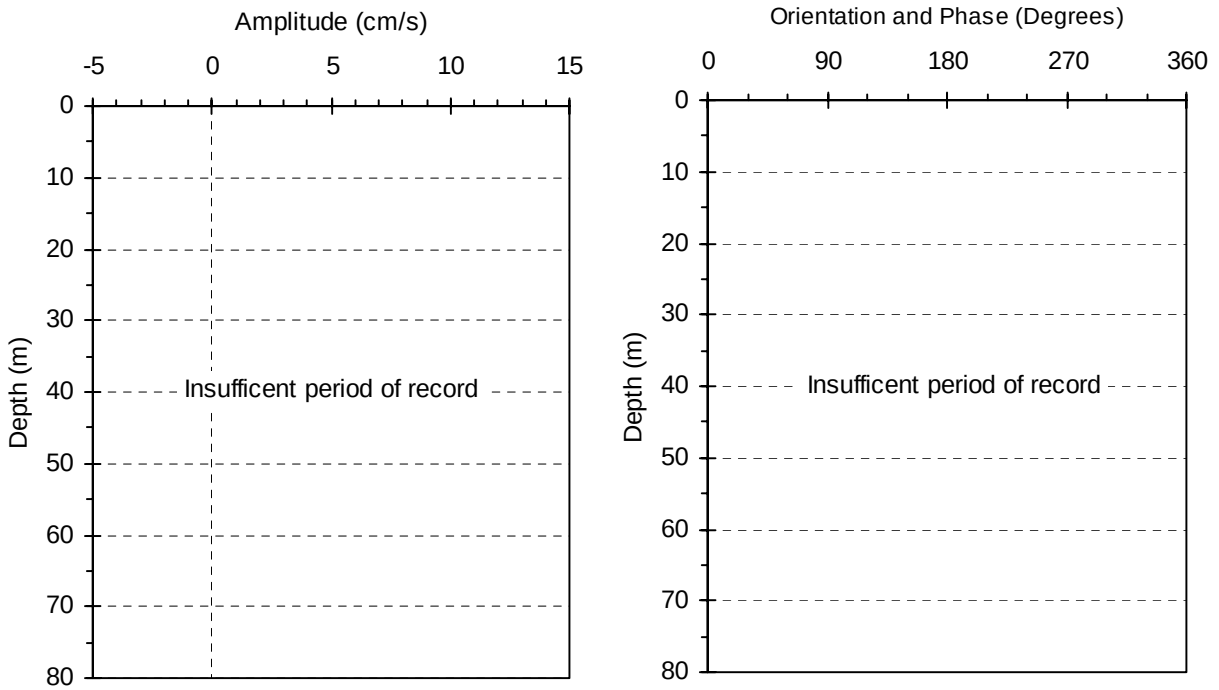
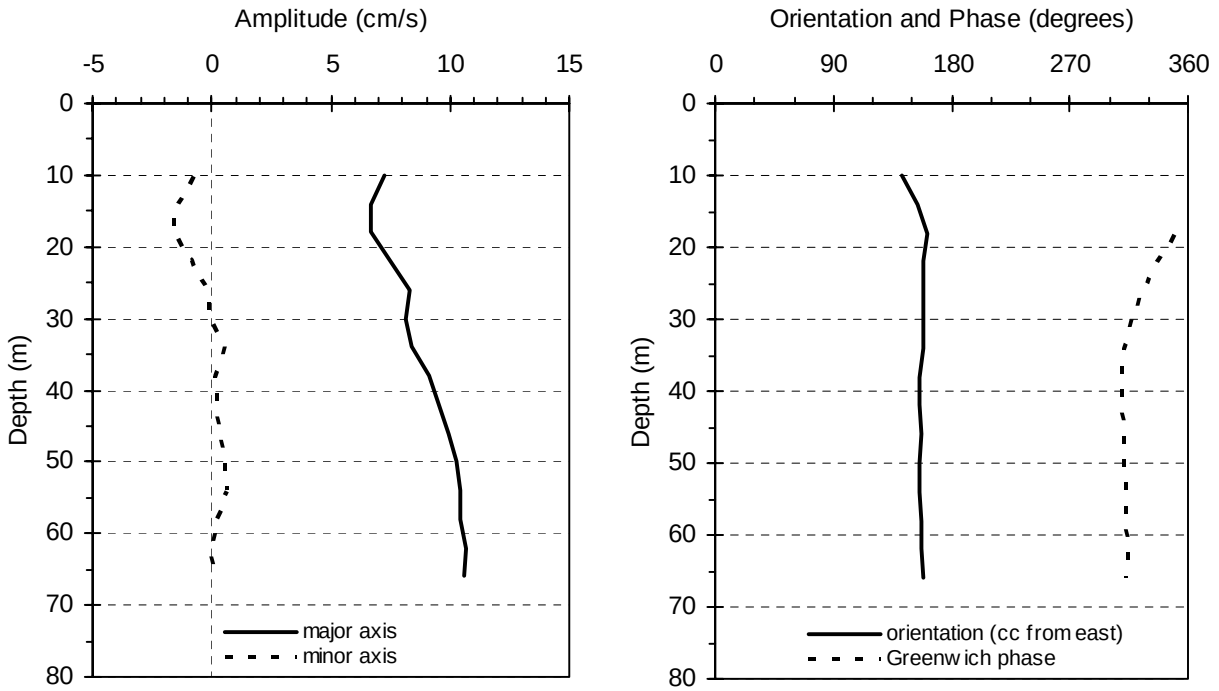


Figure 54 – K1 Tidal Constituent, North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 to Oct. 1, 2002):



For Solid Ice Period (Feb. 19, 2003 to Mar. 15, 2003):

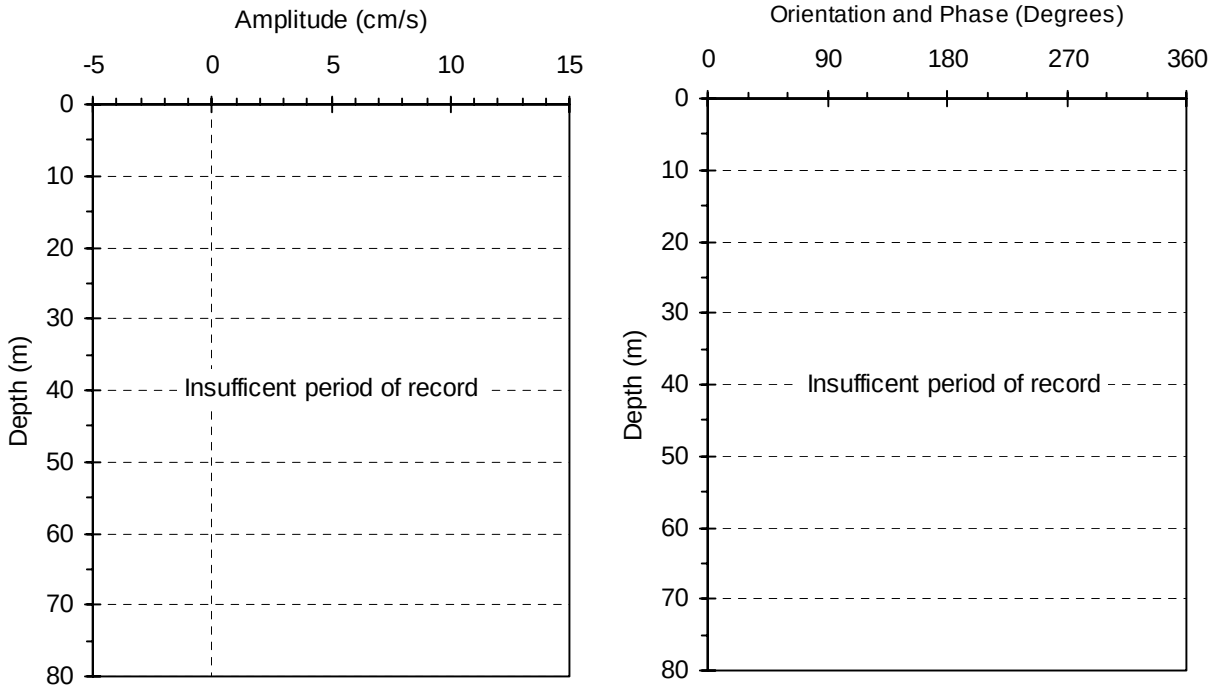
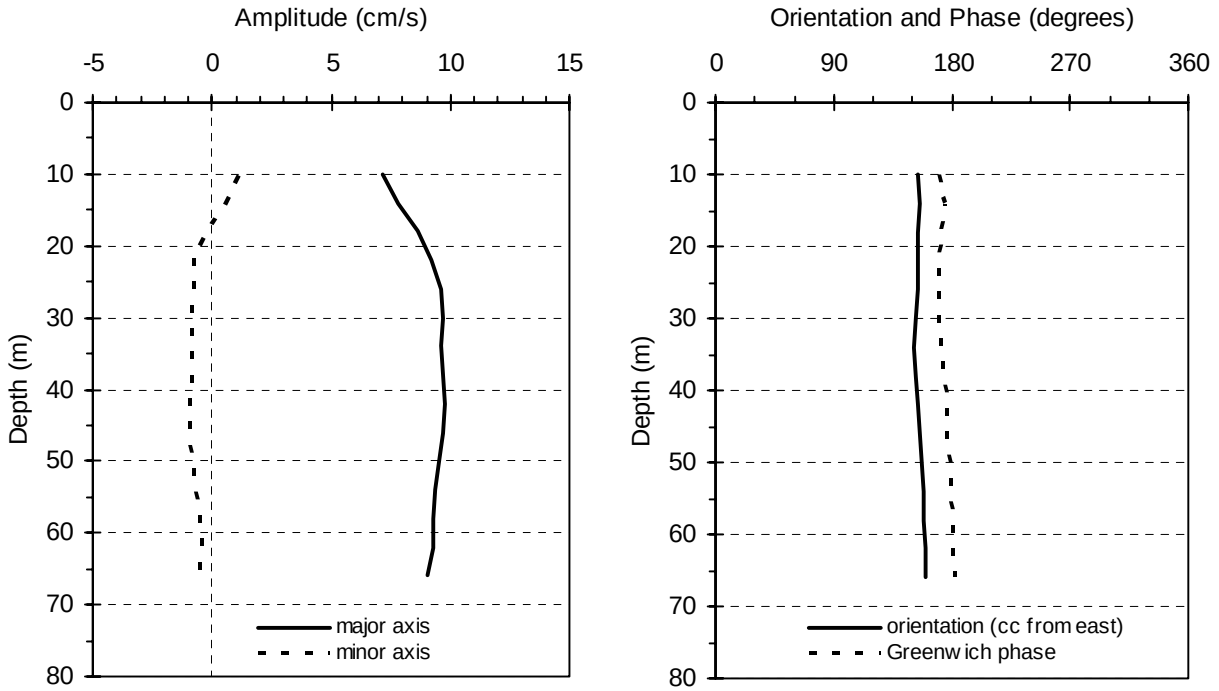


Figure 55 – M2 Tidal Constituent, North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 to Oct. 1, 2002):



For Solid Ice Period (Feb. 19, 2003 to Mar. 15, 2003):

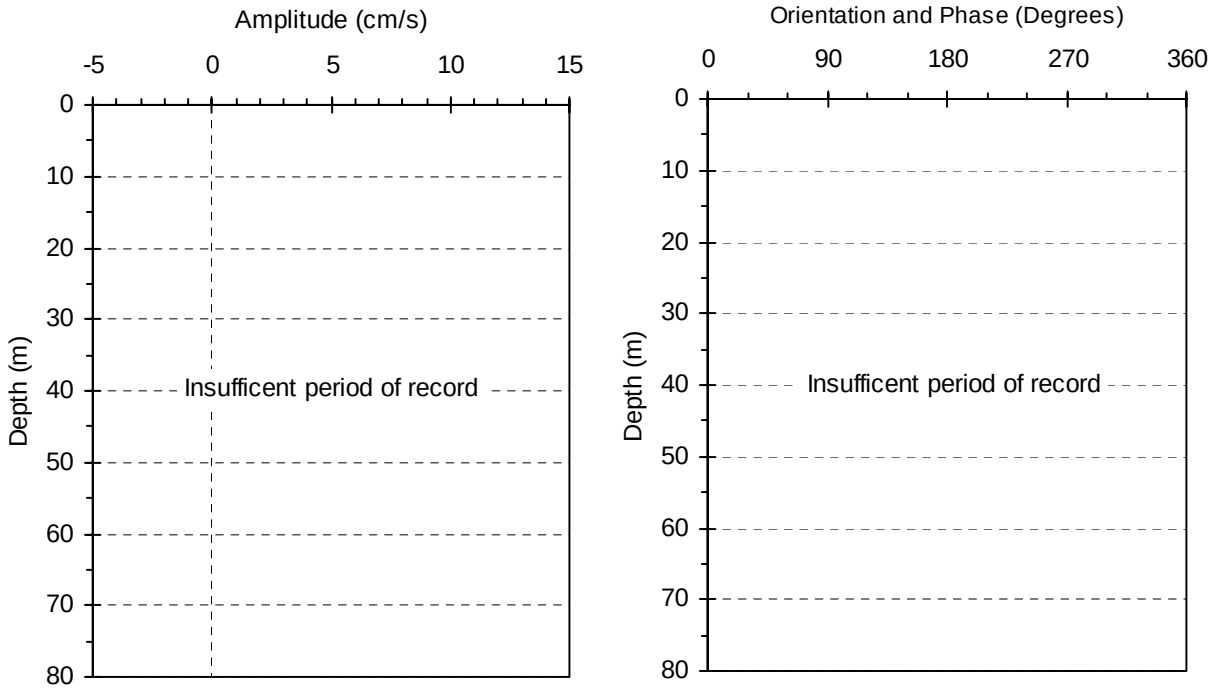
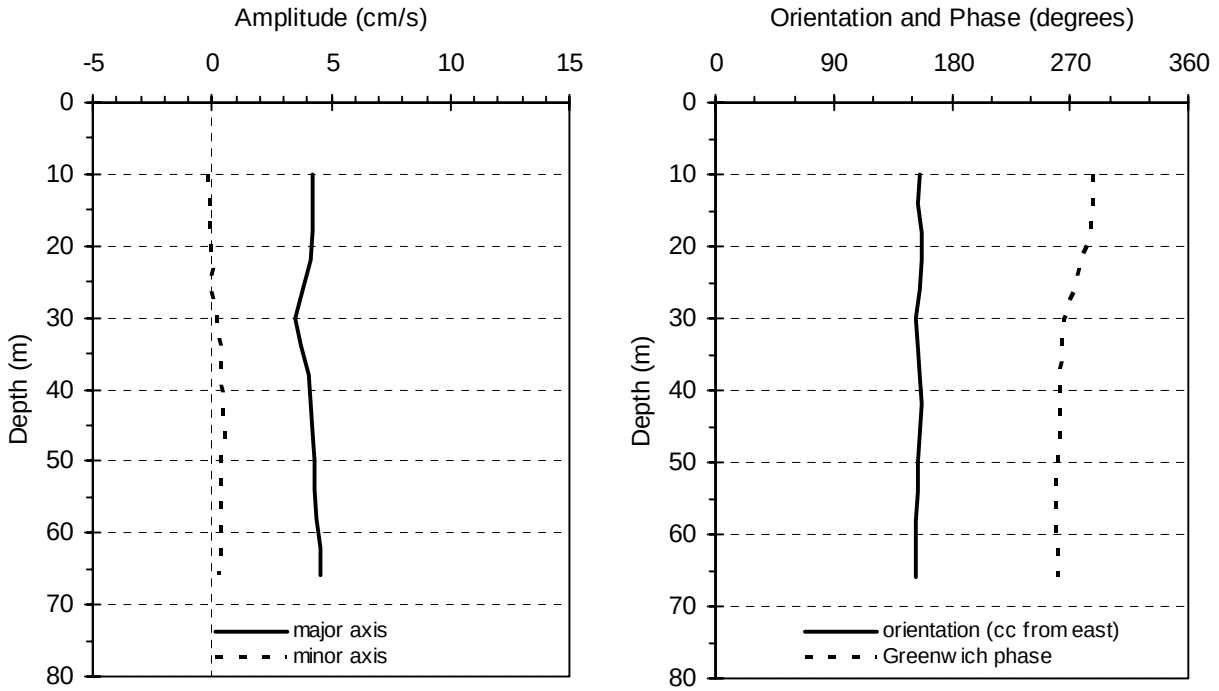


Figure 56 – O1 Tidal Constituent, North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 to Oct. 1, 2002):



For Solid Ice Period (Feb. 19, 2003 to Mar. 15, 2003):

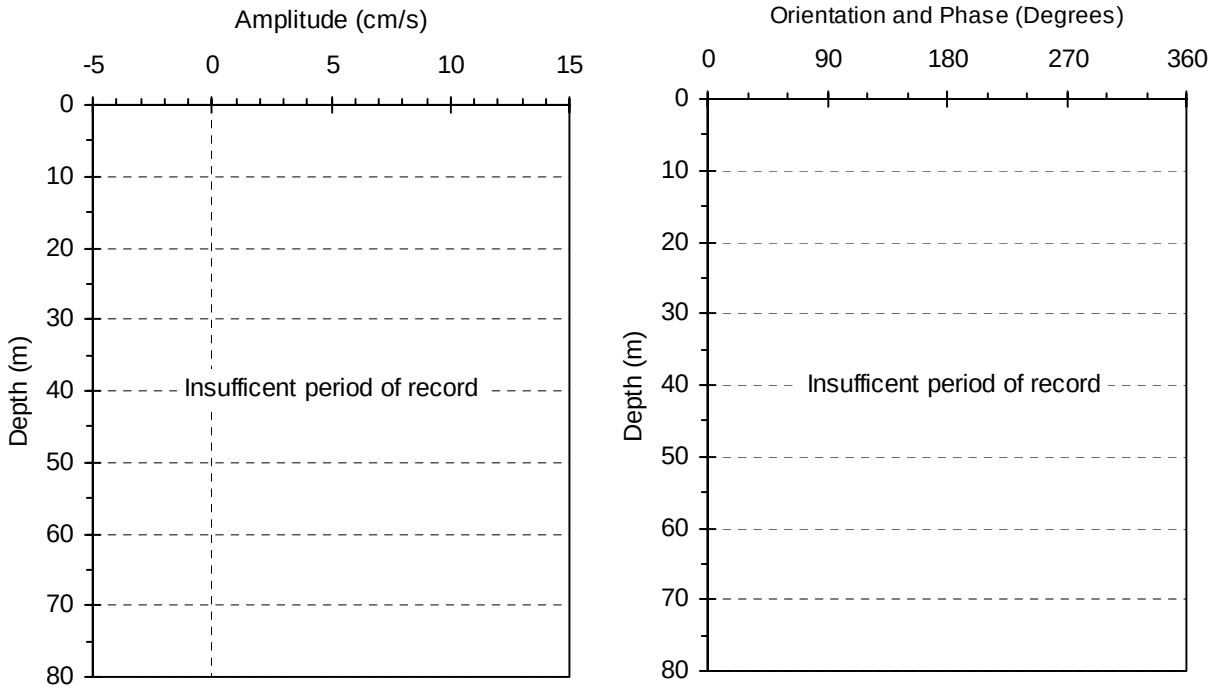
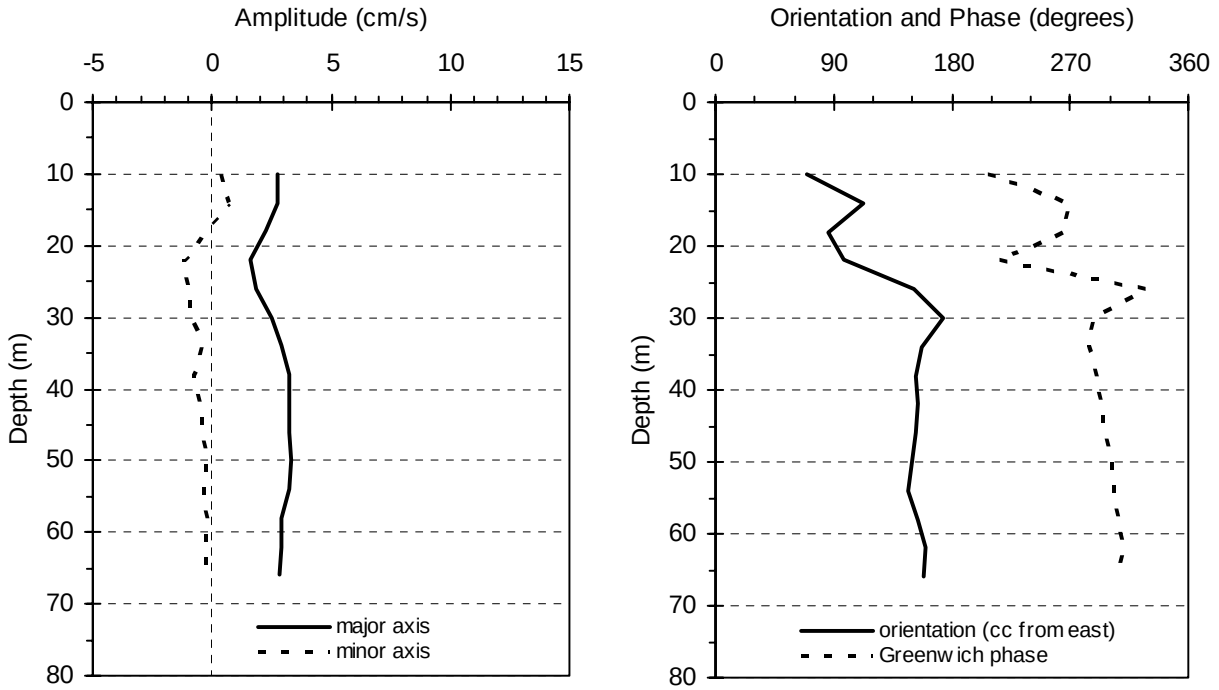


Figure 57 – P1 Tidal Constituent, North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 to Oct. 1, 2002):



For Solid Ice Period (Feb. 19, 2003 to Mar. 15, 2003):

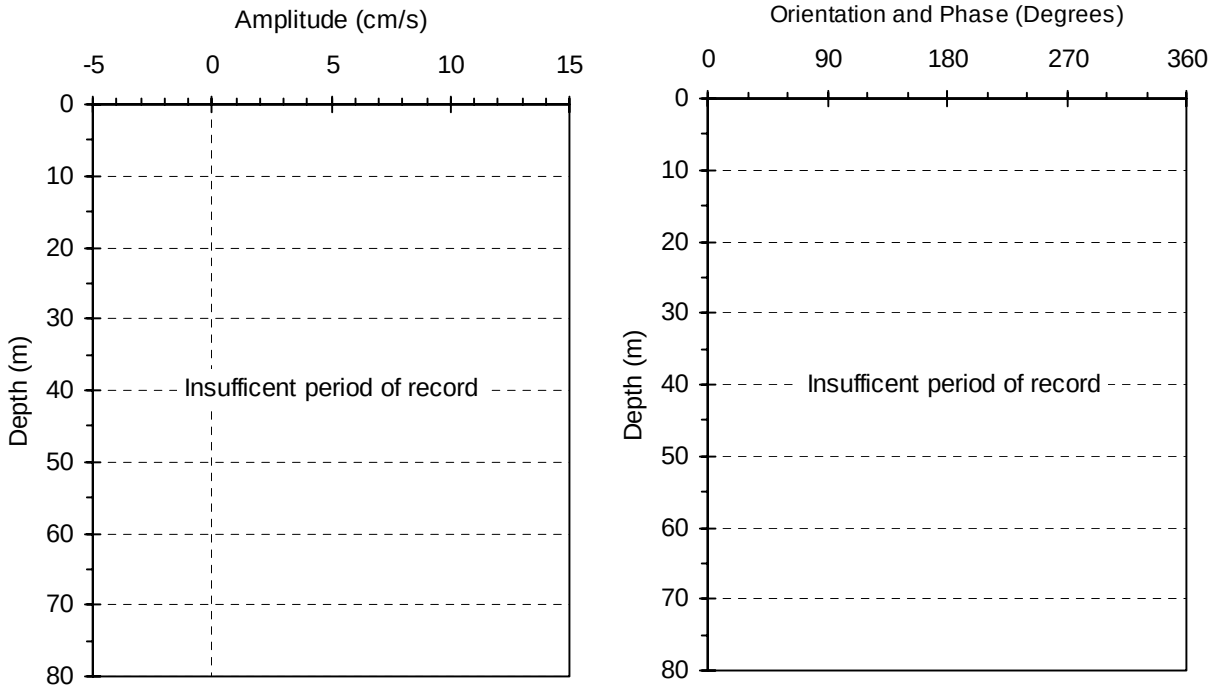
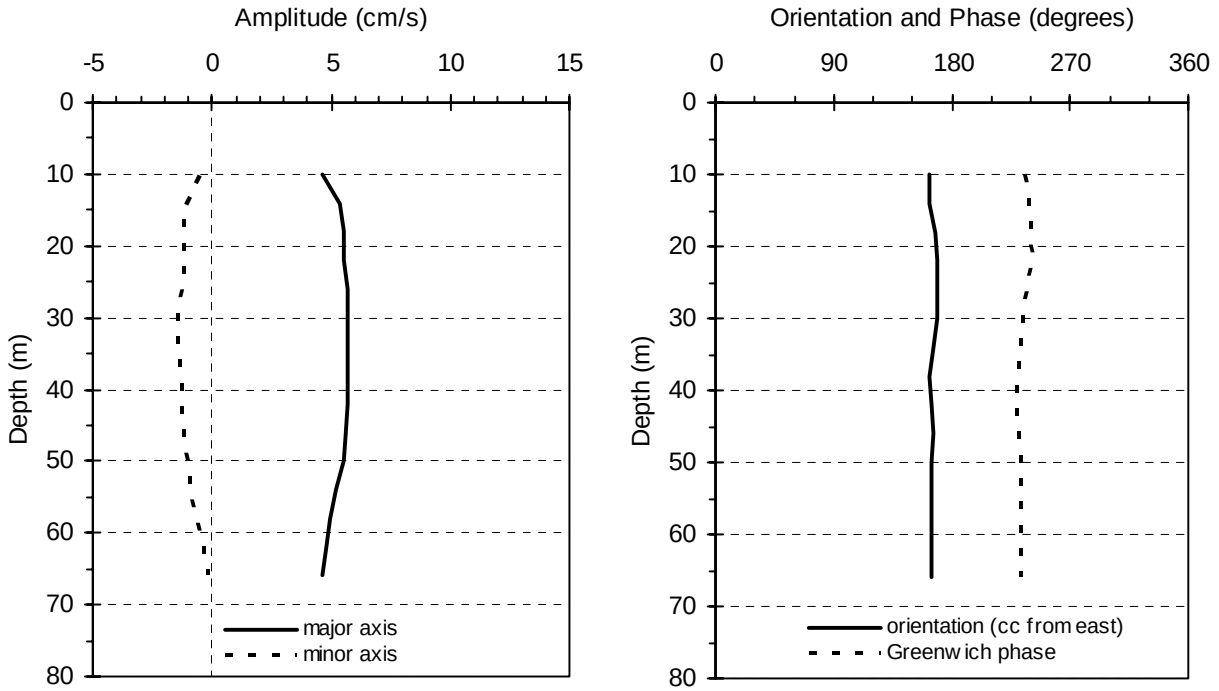
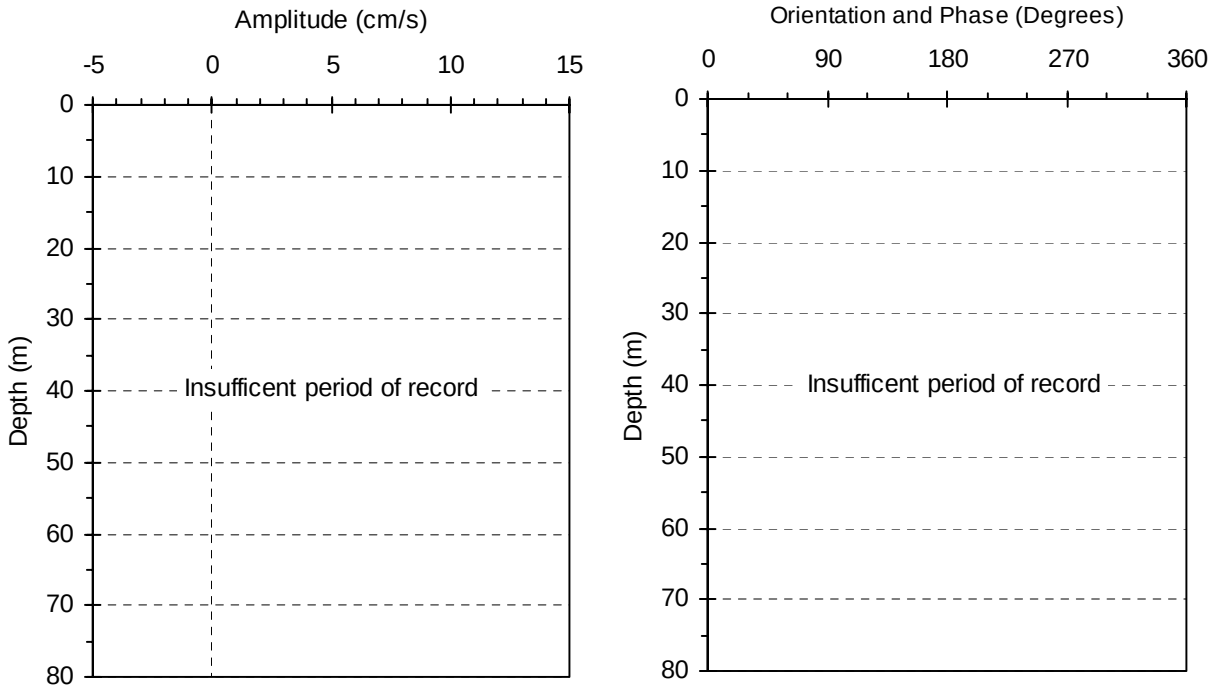


Figure 58 – S2 Tidal Constituent, North Side Barrow Strait

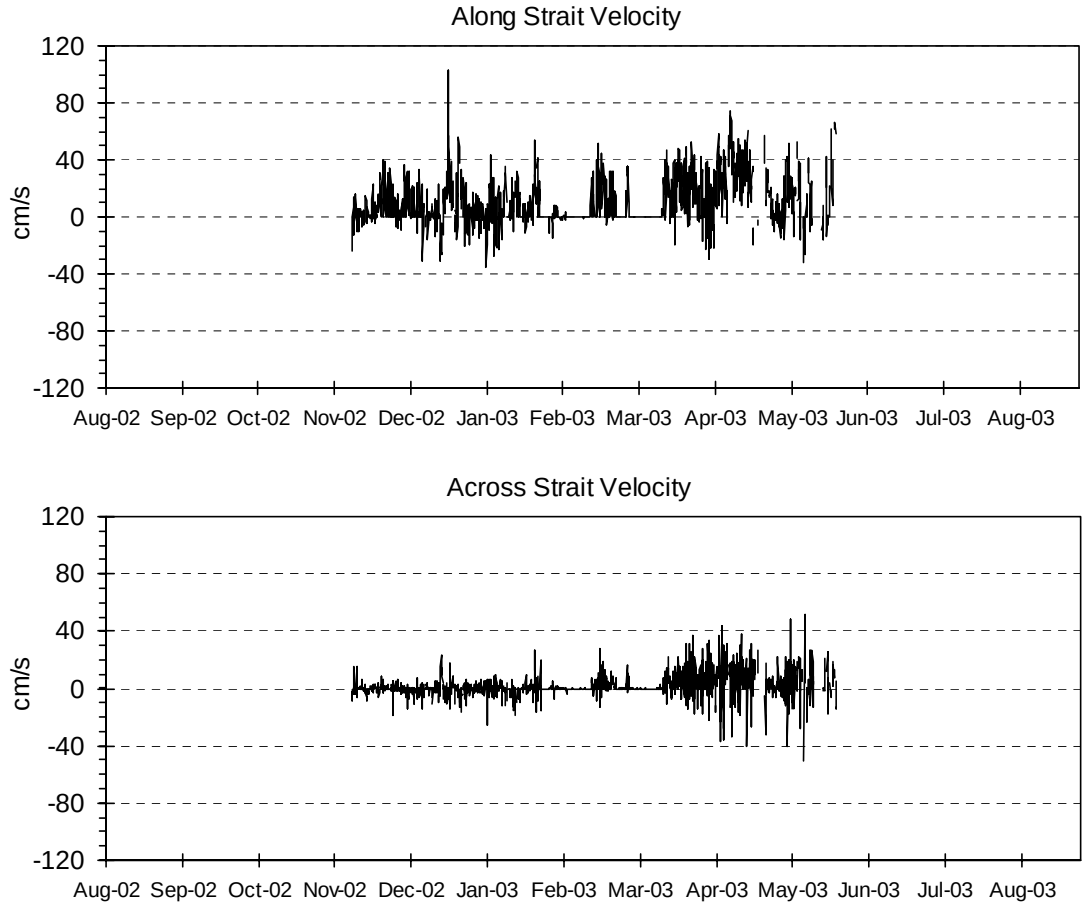
For Ice Free Period (Aug. 19, 2002 to Oct. 1, 2002):



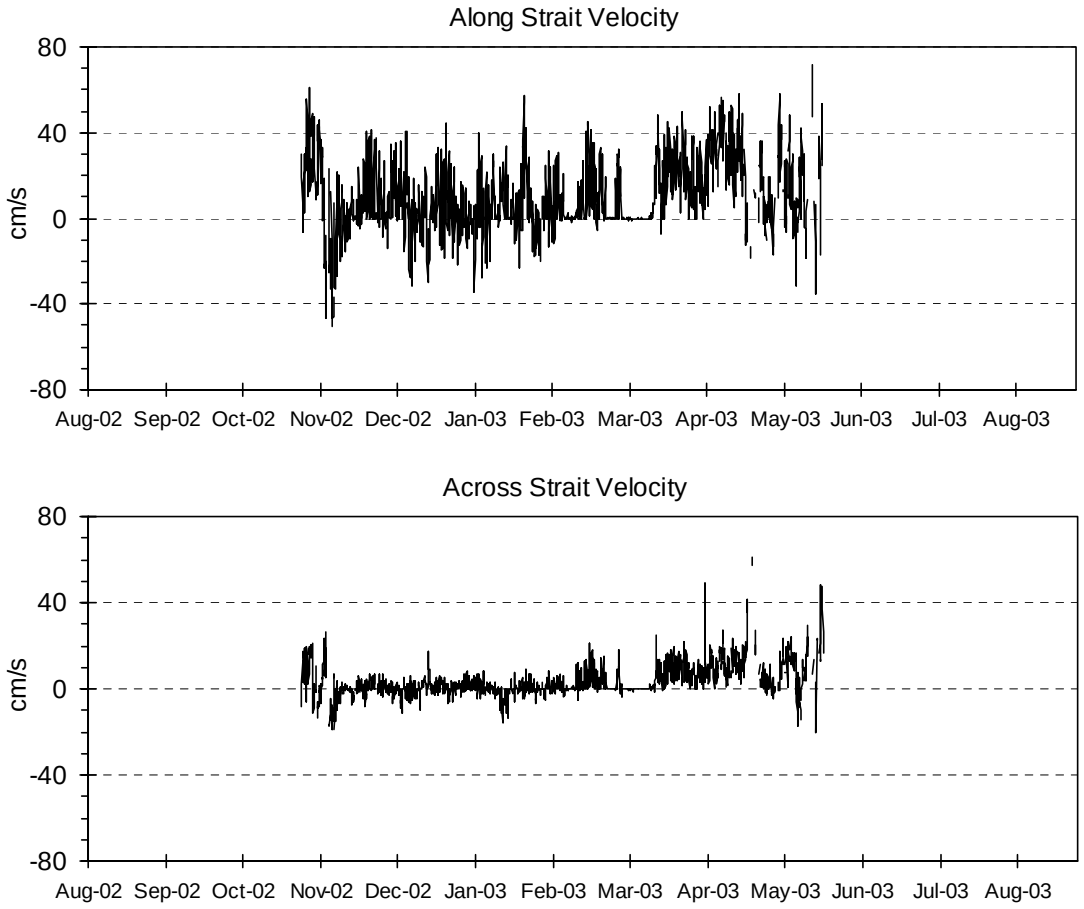
For Solid Ice Period (Feb. 19, 2003 to Mar. 15, 2003):



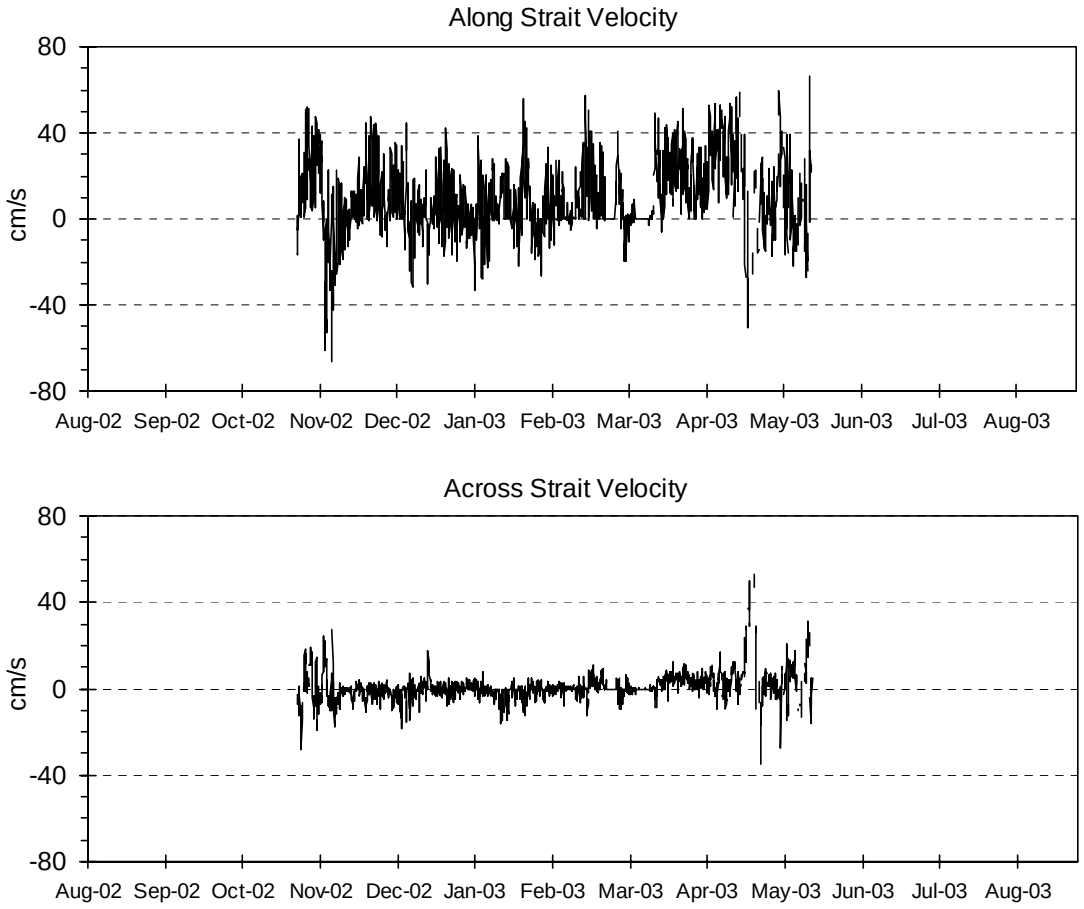
<u>Figure 59</u> – Ice Velocity Data, South Side Barrow Strait
August 2002 – August 2003



<u>Figure 60</u> – Ice Velocity Data, South Central Barrow Strait
August 2002 – August 2003



<u>Figure 61</u> – Ice Velocity Data, Central Barrow Strait
August 2002 – August 2003



<u>Figure 62</u> – Ice Velocity Data, North Side Barrow Strait
August 2002 – August 2003

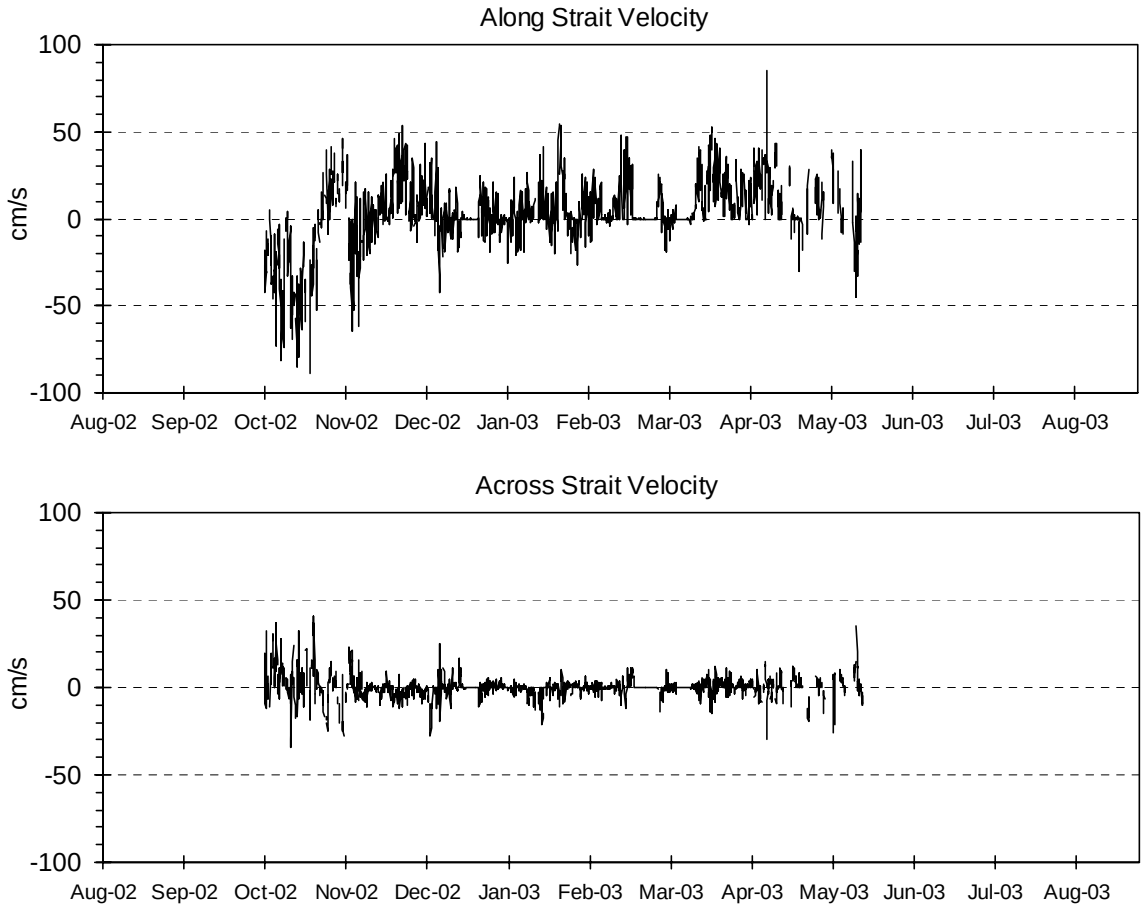
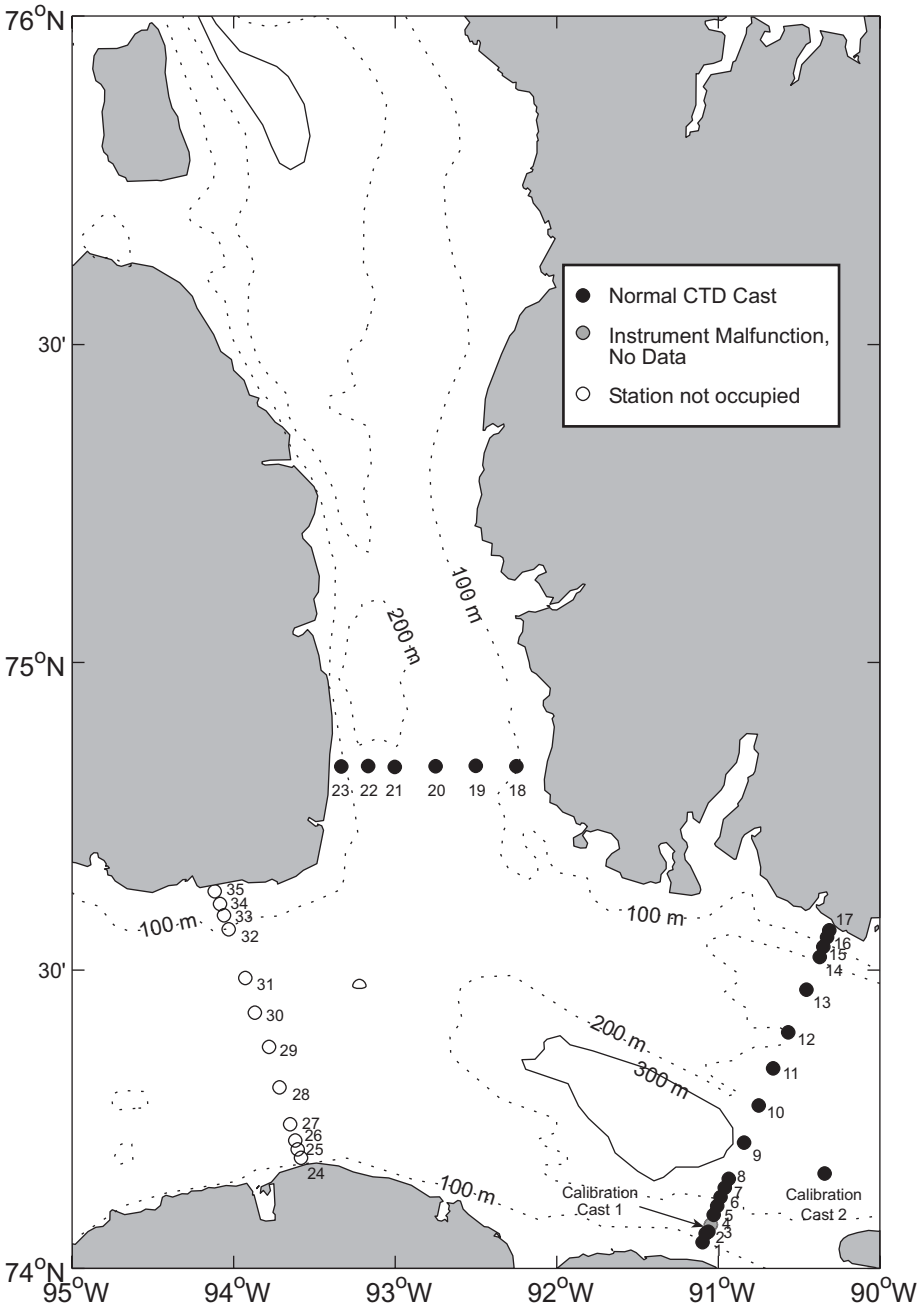
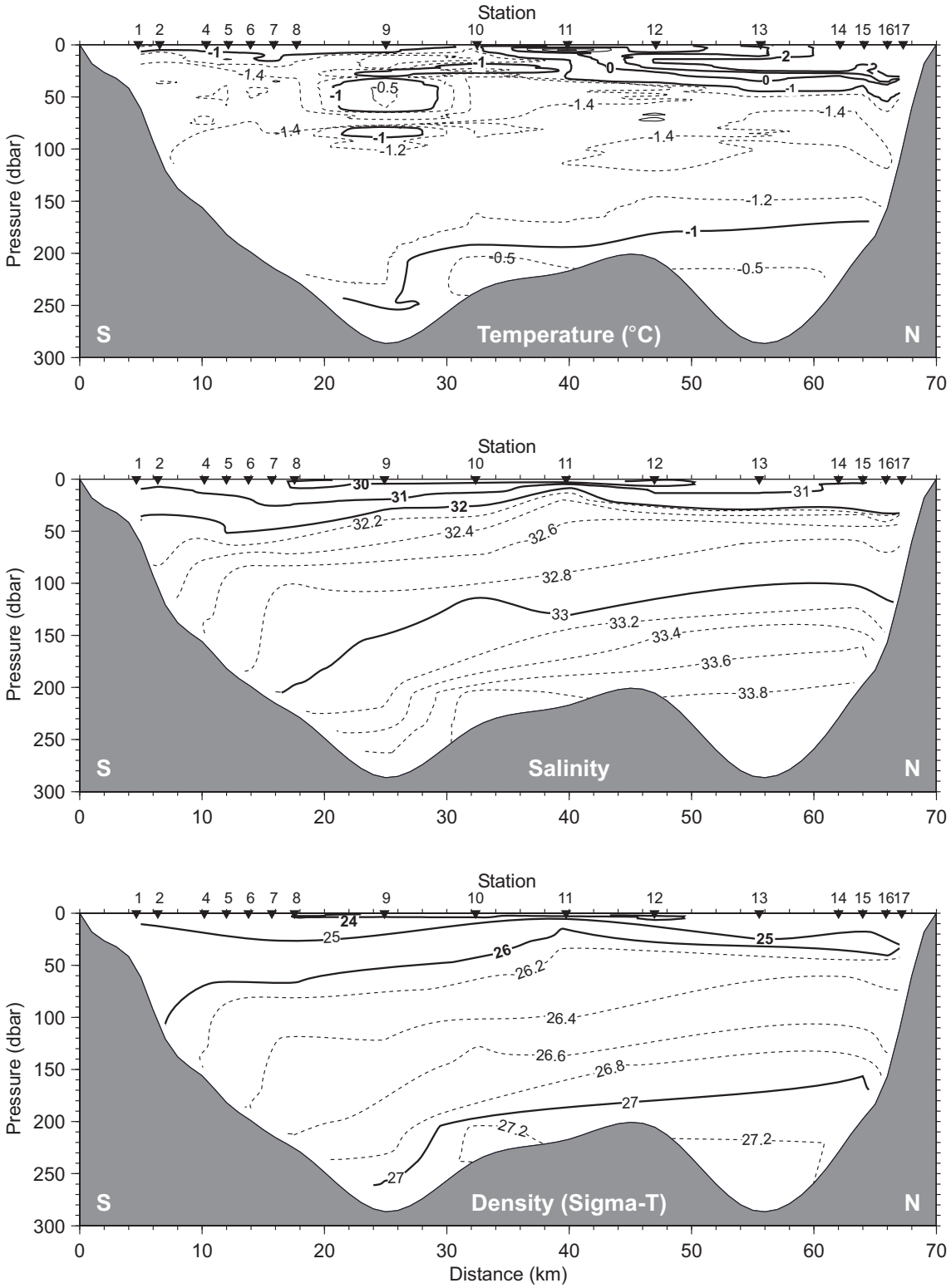


Figure 63 - CTD Station Positions, August 2003



<u>Figure 64</u> – Eastern Barrow Strait CTD Line, Aug. 5-6, 2003.



<u>Figure 65</u> – Wellington Channel CTD Line, Aug. 11, 2003.

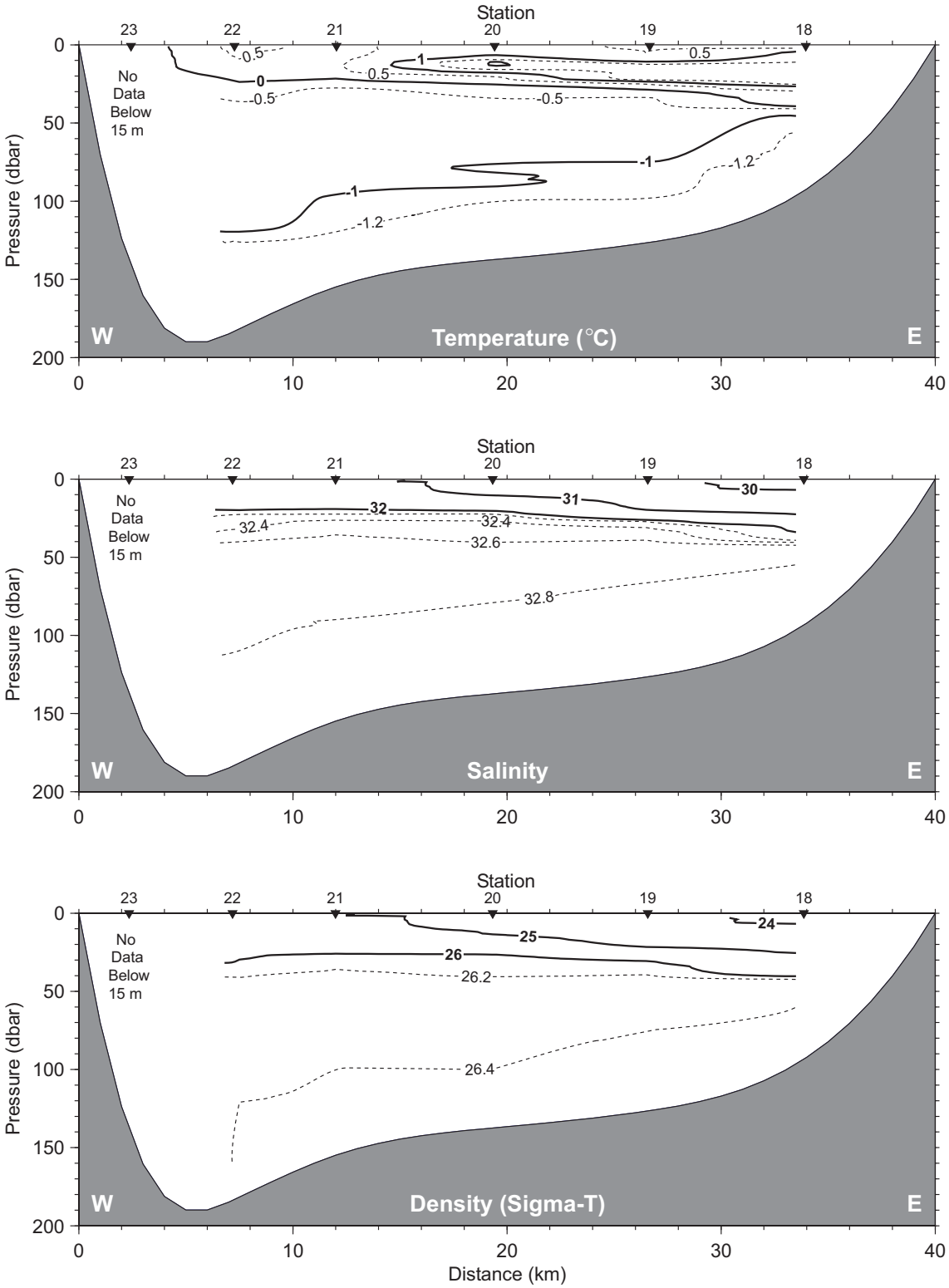


Table 1: South Side Barrow Strait, Microcat/ADCP statistical summary
Late summer: August 20, 2002 - September 20, 2002

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
*40 Icycler	35	-1.23	0.05	-1.30	-1.11	31.57	0.18	31.24	31.87	25.38	0.15	25.11	25.62	32.30	19.07	-21.72	81.93	7.95	6.46	-10.29	29.30
79	79	-1.36	0.03	-1.47	-1.13	32.38	0.10	32.03	32.62	26.04	0.08	25.75	26.24	22.96	17.58	-42.90	79.15	3.45	5.34	-15.46	19.89
147	139	-1.30	0.10	-1.39	-0.80	32.80	0.20	32.44	33.55	26.38	0.16	26.09	26.98	8.97	13.15	-41.14	45.74	1.52	5.40	-13.37	16.15

Table 2: South Central Barrow Strait, Microcat/ADCP statistical summary
Late summer: August 20, 2002 - September 20, 2002

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	39	-1.20	0.21	-1.49	-0.38	32.17	0.17	31.67	32.69	25.87	0.13	25.46	26.29	19.29	13.76	-21.29	52.07	8.70	6.31	-15.04	29.88
79	71	-1.28	0.14	-1.47	-0.66	32.68	0.11	32.32	32.96	26.28	0.09	25.99	26.51	15.54	14.05	-20.48	50.76	7.09	5.55	-8.35	25.66
157		-1.22	0.07	-1.52	-0.98	33.09	0.11	32.52	33.40	26.61	0.08	26.15	26.86								
274		Instrument was damaged, no data recovered.																			

* Microcat statistics are computed from hourly measurements. Icycler CTD sampling occurred just once per day.

Table 3: Central Barrow Strait, Microcat/ADCP statistical summary
Late summer: August 20, 2002 - September 20, 2002

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T))				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
38	38	-1.22	0.16	-1.46	-0.52	32.47	0.13	32.13	32.70	26.11	0.10	25.83	26.30	0.41	14.36	-33.61	36.03	4.90	5.92	-13.95	20.94
78	70	-1.33	0.09	-1.53	-0.85	32.81	0.05	32.65	32.92	26.39	0.04	26.26	26.48	-1.07	13.98	-31.10	32.73	3.93	5.20	-11.97	16.88
157		-1.15	0.06	-1.31	-0.95	33.22	0.09	32.97	33.50	26.72	0.07	26.52	26.94								

Table 4: North Side Barrow Strait, Microcat/ADCP statistical summary
Late summer: August 19, 2002 - September 20, 2002

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
37	38	-1.34	0.08	-1.48	-1.01	32.49	0.11	32.07	32.68	26.13	0.09	25.78	26.28	-6.06	12.79	-40.00	18.94	2.41	4.21	-10.17	14.63
74	66	-1.44	0.07	-1.57	-1.18	32.81	0.06	32.63	32.99	26.39	0.05	26.24	26.54	-5.43	13.36	-41.52	19.49	2.36	3.75	-7.29	15.78
153		-1.17	0.11	-1.40	-0.85	33.24	0.16	32.93	33.62	26.73	0.13	26.49	27.04								

Table 5: South Side Barrow Strait, Microcat/ADCP statistical summary
Fall: September 21, 2002 - December 20, 2002

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40 Icycler	35	-1.40	0.16	-1.74	-0.90	31.65	0.49	30.30	32.32	25.45	0.40	24.36	25.99	16.41	23.94	-54.20	114.73	1.96	8.16	-30.47	34.98
79	79	-1.29	0.05	-1.52	-0.92	32.36	0.31	30.92	32.95	26.03	0.25	24.86	26.50	16.63	21.02	-44.41	98.00	2.17	6.41	-19.86	30.09
147	139	-1.16	0.17	-1.35	-0.62	33.03	0.30	32.26	33.73	26.56	0.23	25.94	27.11	7.13	15.80	-47.95	52.88	0.53	5.61	-20.61	21.59

Table 6: South Central Barrow Strait, Microcat/ADCP statistical summary
Fall: September 21, 2002 - December 20, 2002

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	39	-1.38	0.26	-1.76	-0.68	31.65	0.48	30.47	32.54	25.45	0.39	24.49	26.15	11.05	16.89	-30.06	71.88	5.43	9.21	-23.04	49.66
79	71	-1.27	0.07	-1.59	-0.98	32.51	0.20	31.62	32.92	26.14	0.16	25.42	26.48	7.93	16.72	-40.41	69.36	4.77	8.86	-25.85	42.43
157		-1.16	0.08	-1.36	-0.57	33.13	0.10	32.84	33.68	26.64	0.08	26.41	27.07								
274		Instrument was damaged, no data recovered.																			

Table 7: Central Barrow Strait, Microcat/ADCP statistical summary
Fall: September 21, 2002 - December 20, 2002

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
38	38	-1.44	0.23	-1.76	-0.92	31.80	0.62	30.30	32.72	25.57	0.50	24.36	26.31	2.45	15.26	-40.12	44.28	0.46	7.44	-28.53	36.50
78	70	-1.32	0.08	-1.69	-1.08	32.63	0.17	31.91	32.94	26.24	0.14	25.66	26.49	0.93	14.95	-45.43	44.09	-0.07	7.62	-44.00	35.01
157		-1.07	0.16	-1.28	-0.42	33.26	0.17	32.98	33.85	26.74	0.13	26.52	27.20								

Table 8: North Side Barrow Strait, Microcat/ADCP statistical summary
Fall: September 21, 2002 - December 20, 2002

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T))				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
37	38	-1.45	0.25	-1.78	-0.68	31.66	0.60	29.47	32.47	25.46	0.48	23.68	26.12	-4.21	16.39	-78.96	36.93	0.80	5.64	-27.40	24.31
74	66	-1.35	0.08	-1.65	-0.98	32.54	0.20	31.09	32.88	26.17	0.16	24.99	26.45	-1.17	15.41	-80.16	33.99	0.03	4.82	-18.60	19.19
153		-1.17	0.13	-1.39	-0.77	33.14	0.19	32.72	33.67	26.65	0.15	26.32	27.07								

Table 9: South Side Barrow Strait, Microcat/ADCP statistical summary
Winter: December 21, 2002 - March 20, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40 Icycler	35	-1.65	0.12	-1.77	-1.35	32.12	0.29	31.40	32.62	25.83	0.23	25.26	26.24	7.86	16.88	-43.25	55.89	0.33	6.14	-21.64	23.06
79	79	-1.51	0.17	-1.78	-1.21	32.50	0.15	31.95	32.91	26.14	0.12	25.70	26.47	5.73	21.12	-56.92	62.67	0.15	5.85	-19.47	25.25
147	139	-1.02	0.29	-1.75	-0.50	33.02	0.37	32.26	33.77	26.55	0.30	25.94	27.14	2.76	16.92	-49.21	42.07	-0.40	5.20	-18.52	16.70

Table 10: South Central Barrow Strait, Microcat/ADCP statistical summary
Winter: December 21, 2002 - March 20, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	39	-1.71	0.05	-1.78	-1.42	32.08	0.31	31.32	32.76	25.81	0.25	25.18	26.36	5.15	14.46	-33.45	53.70	1.55	5.60	-12.55	22.75
79	71	-1.53	0.15	-1.78	-1.29	32.52	0.15	32.00	32.92	26.16	0.13	25.74	26.49	4.51	15.23	-39.17	53.56	1.73	6.58	-21.97	26.20
157		-1.09	0.12	-1.50	-0.60	33.22	0.14	32.76	33.71	26.72	0.11	26.35	27.09								
274		Instrument was damaged, no data recovered.																			

Table 11: Central Barrow Strait, Microcat/ADCP statistical summary
Winter: December 21, 2002 - March 20, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
38	38	-1.69	0.07	-1.78	-1.44	32.22	0.26	31.36	32.74	25.92	0.21	25.22	26.34	3.07	14.81	-34.60	42.36	-0.34	5.77	-20.09	21.32
78	70	-1.46	0.14	-1.77	-1.25	32.64	0.13	32.24	32.98	26.26	0.10	25.93	26.53	0.72	15.35	-38.58	46.76	-0.82	6.15	-21.80	19.15
157		-1.11	0.15	-1.51	-0.62	33.33	0.10	33.02	33.73	26.80	0.08	26.56	27.12								

Table 12: North Side Barrow Strait, Microcat/ADCP statistical summary
Winter: December 21, 2002 - March 20, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
37	38	-1.70	0.09	-1.79	-1.36	32.53	0.27	31.87	32.95	26.17	0.22	25.63	26.51	2.89	12.65	-34.69	38.89	-0.48	4.50	-15.84	16.69
74	66	-1.45	0.14	-1.80	-1.25	32.81	0.18	32.30	33.15	26.39	0.15	25.98	26.67	1.48	13.22	-34.57	40.20	-0.60	4.68	-15.49	13.58
153		-1.23	0.16	-1.57	-0.75	33.31	0.11	32.99	33.70	26.79	0.09	26.53	27.10								

Table 13: South Side Barrow Strait, Microcat/ADCP statistical summary
Spring: March 21, 2003 – June 20, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40 Icycler	35	-1.63	0.13	-1.76	-1.04	32.13	0.15	31.82	32.44	25.84	0.13	25.59	26.09	19.71	17.92	-36.73	71.60	4.48	9.61	-39.31	36.74
79	79	-1.57	0.09	-1.76	-1.34	32.54	0.11	32.08	32.85	26.17	0.09	25.81	26.43	15.93	18.02	-46.19	58.69	1.73	5.19	-16.83	18.12
147	139	-1.43	0.13	-1.74	-0.95	32.87	0.17	32.53	33.64	26.44	0.14	26.16	27.05	4.72	13.17	-39.85	39.88	0.47	5.68	-19.87	21.93

Table 14: South Central Barrow Strait, Microcat/ADCP statistical summary
Spring: March 21, 2003 – June 20, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	39	-1.61	0.12	-1.78	-0.56	32.56	0.19	31.82	32.92	26.19	0.16	25.59	26.49	14.06	14.72	-29.62	65.00	7.30	8.66	-14.71	37.54
79	71	-1.61	0.09	-1.78	-1.30	32.77	0.10	32.42	32.96	26.36	0.08	26.08	26.51	11.95	14.38	-27.13	56.38	6.50	7.90	-12.80	32.65
157		-1.38	0.17	-1.77	-0.93	33.08	0.20	32.70	33.59	26.61	0.16	26.30	27.01								
274		Instrument was damaged, no data recovered.																			

Table 15: Central Barrow Strait, Microcat/ADCP statistical summary
Spring: March 21, 2003 – June 20, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
38	38	-1.64	0.08	-1.78	-1.36	32.67	0.18	32.07	32.96	26.28	0.15	25.80	26.52	3.53	16.24	-55.51	50.98	3.37	7.47	-15.79	29.22
78	70	-1.60	0.10	-1.77	-1.28	32.85	0.08	32.53	33.03	26.43	0.06	26.17	26.57	2.64	15.86	-47.37	45.91	2.76	7.28	-20.42	27.62
157		-1.22	0.14	-1.66	-0.81	33.33	0.18	32.86	33.74	26.80	0.15	26.44	27.13								

Table 16: North Side Barrow Strait, Microcat/ADCP statistical summary
Spring: March 21, 2003 – June 20, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
37	38	-1.61	0.19	-1.79	-0.02	32.79	0.21	31.77	33.13	26.38	0.17	25.50	26.66	4.45	14.42	-46.52	43.45	-0.66	4.33	-14.89	13.67
74	66	-1.54	0.11	-1.76	-1.16	33.02	0.11	32.78	33.33	26.56	0.09	26.37	26.82	3.12	13.73	-45.19	37.25	-0.13	3.73	-12.14	11.27
153		-1.43	0.12	-1.66	-0.84	33.42	0.08	33.08	33.70	26.89	0.07	26.61	27.10								

Table 17: South Side Barrow Strait, Microcat/ADCP statistical summary
Early Summer: June 21, 2003 – August 04, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40 Icycler	35	-1.49	0.11	-1.68	-1.21	32.05	0.14	31.53	32.27	25.77	0.12	25.35	25.95	31.40	17.30	-9.13	91.81	3.55	8.11	-23.62	31.37
79	79	-1.43	0.09	-1.65	-0.80	32.53	0.12	32.08	32.86	26.16	0.09	25.80	26.43	26.50	17.19	-15.07	83.36	2.60	5.48	-11.28	21.98
147	139	-1.38	0.06	-1.59	-1.27	32.77	0.11	32.39	33.04	26.36	0.09	26.05	26.57	10.73	12.54	-29.84	48.37	1.47	5.52	-16.36	18.43

Table 18: South Central Barrow Strait, Microcat/ADCP statistical summary
Early Summer: June 21, 2003 – August 04, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	39	-1.39	0.23	-1.71	-0.01	32.51	0.20	31.76	32.91	26.15	0.16	25.54	26.48	19.81	17.24	-23.32	73.44	6.75	7.97	-15.79	30.86
79	71	-1.47	0.10	-1.75	-0.93	32.78	0.09	32.27	32.99	26.37	0.07	25.94	26.53	17.13	17.10	-22.22	65.83	5.95	7.05	-10.31	27.40
157		-1.31	0.08	-1.54	-1.05	33.11	0.16	32.87	33.58	26.63	0.13	26.44	27.01								
274		Instrument was damaged, no data recovered.																			

Table 19: Central Barrow Strait, Microcat/ADCP statistical summary
Early Summer: June 21, 2003 – August 03, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
38	38	-1.39	0.20	-1.65	-0.45	32.69	0.10	32.27	32.95	26.29	0.08	25.93	26.51	6.02	15.54	-41.72	44.98	-0.07	6.79	-26.83	18.57
78	70	-1.48	0.07	-1.68	-0.94	32.90	0.05	32.70	33.03	26.46	0.04	26.30	26.57	4.77	15.21	-35.88	41.32	0.02	6.03	-16.11	24.26
157		-1.18	0.07	-1.41	-0.98	33.45	0.08	33.10	33.66	26.91	0.06	26.63	27.07								

Table 20: North Side Barrow Strait, Microcat/ADCP statistical summary
Early Summer: June 21, 2003 – August 03, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
37	38	-1.29	0.18	-1.60	-0.55	32.56	0.14	31.96	32.84	26.18	0.12	25.68	26.42	-0.43	14.15	-47.42	30.06	0.52	4.92	-12.59	14.32
74	66	-1.52	0.05	-1.64	-1.36	32.89	0.04	32.78	33.08	26.46	0.03	26.37	26.61	1.03	14.64	-48.35	31.09	0.26	4.40	-14.84	13.17
153		-1.25	0.09	-1.45	-0.93	33.42	0.10	33.15	33.75	26.88	0.08	26.67	27.13								

Table 21: South Side Barrow Strait, Microcat/ADCP statistical summary
Complete Record: August 20, 2002 – August 04, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40 Icycler	35	-1.52	0.19	-1.77	-0.90	31.95	0.38	30.30	32.62	25.69	0.31	24.36	26.24	18.47	21.16	-54.20	114.73	2.95	8.28	-39.31	36.74
79	79	-1.44	0.15	-1.78	-0.80	32.47	0.21	30.92	32.95	26.11	0.17	24.86	26.50	15.75	21.01	-56.92	98.00	1.82	5.99	-19.86	30.09
147	139	-1.24	0.25	-1.75	-0.50	32.93	0.29	32.26	33.77	26.48	0.23	25.94	27.14	5.99	15.07	-49.21	52.88	0.48	5.53	-20.61	21.93

Table 22: South Central Barrow Strait, Microcat/ADCP statistical summary
Complete Record: August 20, 2002 – August 04, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	39	-1.51	0.25	-1.78	-0.01	32.16	0.48	30.47	32.92	25.86	0.39	24.49	26.49	12.18	16.32	-33.45	73.44	5.39	8.22	-23.04	49.66
79	71	-1.45	0.18	-1.78	-0.66	32.63	0.19	31.62	32.99	26.25	0.16	25.42	26.53	9.97	16.16	-40.41	69.36	4.80	7.81	-25.85	42.43
157		-1.22	0.17	-1.77	-0.57	33.14	0.16	32.52	33.71	26.65	0.13	26.15	27.09								
274		Instrument was damaged, no data recovered.																			

Table 23: Central Barrow Strait, Microcat/ADCP statistical summary
Complete Record: August 20, 2002 – August 03, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
38	38	-1.53	0.22	-1.78	-0.45	32.31	0.50	30.30	32.96	25.99	0.41	24.36	26.52	3.16	15.42	-55.51	50.98	1.36	7.08	-28.53	36.50
78	70	-1.45	0.15	-1.77	-0.85	32.74	0.16	31.91	33.03	26.34	0.13	25.66	26.57	1.63	15.32	-47.37	46.76	0.86	6.98	-44.00	35.01
157		-1.14	0.15	-1.66	-0.42	33.32	0.16	32.86	33.85	26.79	0.12	26.44	27.20								

Table 24: North Side Barrow Strait, Microcat/ADCP statistical summary
Complete Record: August 19, 2002 – August 03, 2003

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Micro Cat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
37	38	-1.52	0.23	-1.79	-0.02	32.37	0.56	29.47	33.13	26.04	0.46	23.68	26.66	0.19	14.88	-78.96	43.45	0.20	4.90	-27.40	24.31
74	66	-1.46	0.13	-1.80	-0.98	32.80	0.23	31.09	33.33	26.39	0.19	24.99	26.82	0.53	14.35	-80.16	40.20	0.07	4.44	-18.60	19.19
153		-1.26	0.17	-1.66	-0.75	33.30	0.18	32.72	33.75	26.79	0.14	26.32	27.13								

Table 25 - Tidal Constants for K1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 28, 2002 – Nov. 9, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	9.24	-2.12	161	17
15	8.60	-1.28	165	7
19	8.12	-0.25	170	4
23	7.66	0.03	169	3
27	7.42	0.33	169	360
31	7.79	0.21	168	359
35	8.18	0.10	167	0
39	8.65	0.02	167	2
43	8.84	0.11	167	1
47	9.03	0.40	167	360
51	9.11	0.35	166	1
55	8.82	0.34	166	2
59	8.55	0.50	166	1
63	8.56	0.52	166	358
67	8.55	0.40	166	354
71	8.55	0.26	166	349
75	9.07	0.38	163	346
79	8.76	0.52	164	344
83	8.92	0.54	164	343
87	9.07	0.55	162	343
91	9.13	0.65	161	341
95	9.33	0.82	161	339
99	9.39	1.12	161	336
103	9.37	1.48	161	335
107	9.46	1.74	160	334
111	9.58	1.85	160	334
115	9.46	2.00	161	335
119	9.26	2.28	161	334
123	9.25	2.63	162	334
127	9.31	2.82	162	333
131	9.31	2.80	163	332
135	9.38	2.60	164	331
139	9.47	2.50	164	327

Table 25 - Tidal Constants for K1 Constituent (continued)

South Side Barrow Strait

For Solid Ice Period (Jan. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	2.81	-1.45	146	13
15	5.41	-1.55	170	354
19	8.39	-0.88	170	332
23	6.74	-1.30	164	326
27	5.67	-0.64	156	323
31	5.20	-0.44	155	331
35	6.23	0.06	159	329
39	6.65	0.20	159	326
43	6.57	0.32	157	320
47	6.57	0.50	156	321
51	6.23	1.00	153	318
55	6.20	1.17	155	319
59	6.25	1.43	153	321
63	6.36	1.49	151	319
67	6.44	1.00	151	315
71	6.49	0.97	152	314
75	9.91	0.18	197	253
79	6.33	3.83	182	202
83	8.38	2.66	152	332
87	10.69	1.11	151	320
91	10.95	1.04	151	317
95	10.25	1.14	149	314
99	10.92	1.37	151	313
103	11.68	0.95	150	313
107	12.24	0.89	151	313
111	12.60	1.26	153	313
115	12.48	1.45	156	312
119	12.70	1.08	160	311
123	12.78	0.66	159	308
127	13.68	0.11	157	306
131	14.89	-0.18	159	307
135	15.73	-0.33	166	309
139	15.22	-0.24	172	310

Table 25 - Tidal Constants for K1 Constituent (continued)

South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 25, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	10.83	0.10	171	358
15	10.68	-0.47	168	355
19	10.40	-0.20	168	352
23	10.23	0.27	169	352
27	10.83	-0.12	169	353
31	11.15	-0.25	167	354
35	11.33	-0.34	167	354
39	11.96	-0.30	166	352
43	12.05	-0.15	165	352
47	12.05	-0.16	163	354
51	12.40	-0.10	164	353
55	12.79	-0.20	164	353
59	13.00	-0.36	163	354
63	12.87	-0.57	162	353
67	12.92	-0.61	162	352
71	12.84	-0.59	161	351

For Solid Ice Period (Feb. 7, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	6.04	-1.14	181	339
15	6.55	-2.15	173	312
19	6.76	-2.55	179	300
23	9.20	-2.22	182	305
27	9.65	-0.90	176	333
31	10.97	-0.53	174	351
35	11.24	-0.62	173	354
39	11.32	-1.30	171	355
43	10.92	-1.39	169	356
47	11.01	-1.77	168	354
51	11.09	-2.11	170	353
55	10.99	-2.27	169	356
59	10.99	-2.04	166	357
63	11.16	-1.62	167	358
67	10.99	-1.63	166	358
71	10.96	-1.89	166	358

Table 25 - Tidal Constants for K1 Constituent (continued)

Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 23, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	11.74	-0.44	165	6
14	11.65	-0.91	169	8
18	12.09	-1.58	169	7
22	12.25	-2.22	169	5
26	11.86	-2.24	168	6
30	11.71	-2.27	167	6
34	12.23	-2.77	166	8
38	12.50	-2.83	167	7
42	12.49	-2.94	168	6
46	12.53	-2.89	168	6
50	12.52	-2.78	168	7
54	12.47	-2.74	167	8
58	12.65	-2.46	167	9
62	12.34	-2.34	167	9
66	12.14	-2.38	167	9
70	12.05	-2.32	168	9

For Solid Ice Period (Feb. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				
70				

Table 25 - Tidal Constants for K1 Constituent (continued)

North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 – Oct. 1, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	7.21	-0.78	142	356
14	6.65	-1.42	154	4
18	6.66	-1.63	162	349
22	7.53	-0.84	159	336
26	8.29	-0.16	158	327
30	8.17	0.00	159	317
34	8.42	0.53	158	311
38	9.11	0.17	155	309
42	9.51	0.22	156	310
46	9.95	0.30	157	311
50	10.30	0.54	156	311
54	10.41	0.63	155	312
58	10.40	0.25	156	313
62	10.71	-0.01	158	314
66	10.58	0.07	158	313

For Solid Ice Period (Feb. 19, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				

Table 26 - Tidal Constants for M2 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 28, 2002 – Nov. 9, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	7.31	0.59	164	202
15	7.63	0.35	164	199
19	7.85	0.22	161	200
23	7.88	0.22	159	201
27	7.89	0.53	157	199
31	8.10	0.61	157	197
35	8.29	0.37	156	198
39	8.56	-0.09	154	199
43	8.75	-0.30	153	198
47	8.79	-0.50	153	199
51	8.72	-0.76	154	199
55	8.78	-0.85	156	200
59	9.02	-0.84	159	203
63	9.37	-0.91	160	205
67	9.47	-1.06	161	206
71	9.54	-1.27	161	206
75	10.01	-1.45	159	207
79	10.18	-1.61	159	208
83	10.17	-1.69	158	206
87	10.18	-1.62	158	206
91	10.06	-1.50	158	206
95	9.98	-1.31	158	207
99	9.83	-1.32	158	208
103	9.72	-1.31	157	208
107	9.62	-1.28	157	209
111	9.53	-1.06	157	209
115	9.47	-0.77	158	210
119	9.40	-0.49	159	211
123	9.38	-0.44	161	212
127	9.20	-0.38	163	213
131	8.99	-0.31	165	215
135	8.76	-0.27	168	217
139	8.47	-0.10	171	218

Table 26 - Tidal Constants for M2 Constituent (continued)

South Side Barrow Strait

For Solid Ice Period (Jan. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	2.63	0.38	178	195
15	3.93	0.78	171	200
19	5.83	0.61	165	196
23	7.28	0.24	164	197
27	7.89	-0.39	164	201
31	8.22	-0.51	163	198
35	8.00	-1.00	163	197
39	8.46	-1.39	165	196
43	8.61	-1.71	165	196
47	8.79	-1.94	165	197
51	8.94	-2.10	165	198
55	9.12	-2.31	166	198
59	9.26	-2.36	168	197
63	9.36	-2.56	167	198
67	9.38	-2.65	165	199
71	9.22	-2.51	164	199
75	11.97	-2.37	169	193
79	10.67	-2.59	168	190
83	10.76	-2.45	162	201
87	10.07	-2.10	160	201
91	9.11	-1.68	157	201
95	8.94	-1.45	158	198
99	8.51	-1.21	156	197
103	8.36	-0.95	155	196
107	8.29	-0.82	157	197
111	8.27	-0.89	158	198
115	8.31	-0.97	159	199
119	8.29	-1.06	161	199
123	8.09	-0.95	164	199
127	7.76	-0.54	169	202
131	7.41	-0.20	172	208
135	6.82	-0.08	175	209
139	6.47	0.33	177	208

Table 26 - Tidal Constants for M2 Constituent (continued)

South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 25, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	6.16	0.08	199	228
15	6.38	0.02	183	213
19	7.49	-0.41	171	198
23	8.60	-0.92	165	190
27	9.18	-1.20	162	187
31	9.23	-1.66	161	188
35	9.27	-1.82	162	189
39	9.33	-1.81	164	190
43	9.70	-1.87	167	192
47	9.99	-2.07	168	193
51	10.04	-2.22	167	195
55	9.95	-2.20	167	197
59	9.71	-2.00	168	197
63	9.62	-1.97	168	197
67	9.58	-2.13	169	198
71	9.60	-2.08	170	199

For Solid Ice Period (Feb. 7, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	4.90	1.44	177	183
15	6.09	1.74	171	182
19	6.20	1.54	165	181
23	7.46	1.13	169	184
27	6.96	0.73	169	187
31	6.52	0.43	170	192
35	7.00	0.08	172	197
39	7.70	-0.26	171	197
43	8.21	-0.53	171	198
47	8.49	-0.86	171	198
51	8.80	-1.14	172	198
55	9.04	-1.59	171	197
59	9.29	-2.06	171	196
63	9.41	-2.36	171	195
67	9.55	-2.31	171	195
71	9.57	-2.20	171	195

Table 26 - Tidal Constants for M2 Constituent (continued)

Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 23, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	8.81	-0.36	185	214
14	9.95	-1.42	173	204
18	10.80	-2.35	167	198
22	10.78	-2.35	163	193
26	10.24	-1.95	160	190
30	9.85	-1.63	160	190
34	9.66	-1.30	161	192
38	9.37	-1.00	162	195
42	9.07	-0.90	163	197
46	9.11	-0.94	164	198
50	9.27	-1.11	166	197
54	9.40	-1.35	166	198
58	9.52	-1.37	167	199
62	9.54	-1.49	168	199
66	9.66	-1.49	169	201
70	9.62	-1.47	169	202

For Solid Ice Period (Feb. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				
70				

Table 26 - Tidal Constants for M2 Constituent (continued)

North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 – Oct. 1, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	7.19	1.12	154	170
14	7.79	0.54	156	174
18	8.61	-0.29	153	172
22	9.21	-0.79	154	170
26	9.61	-0.79	154	170
30	9.70	-0.80	152	170
34	9.58	-0.85	151	172
38	9.73	-0.85	153	174
42	9.78	-0.94	154	176
46	9.68	-0.95	155	177
50	9.57	-0.84	157	179
54	9.41	-0.66	159	179
58	9.32	-0.48	159	180
62	9.28	-0.46	161	181
66	9.06	-0.50	160	182
70	7.19	1.12	154	170

For Solid Ice period (Feb. 19, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				

Table 27 - Tidal Constants for O1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 28, 2002 – Nov. 9, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	4.05	-0.20	159	304
15	3.98	-0.21	162	302
19	3.75	0.01	164	301
23	3.60	0.11	163	298
27	3.60	-0.02	167	298
31	3.63	-0.10	169	298
35	3.51	0.02	167	299
39	3.26	0.11	171	305
43	3.22	-0.03	171	307
47	3.15	0.01	167	306
51	3.03	0.19	168	310
55	3.00	0.26	166	311
59	3.15	0.17	166	310
63	3.30	0.02	167	309
67	3.38	0.09	167	306
71	3.40	0.15	166	306
75	3.47	0.07	167	305
79	3.50	-0.03	165	306
83	3.58	-0.14	164	303
87	3.73	0.05	164	301
91	3.81	0.20	166	297
95	3.77	0.23	166	297
99	3.59	0.47	168	296
103	3.47	0.85	169	294
107	3.42	1.16	167	291
111	3.35	1.19	169	290
115	3.33	1.12	169	288
119	3.50	1.11	168	285
123	3.65	1.00	167	281
127	3.79	0.92	165	279
131	3.90	0.80	162	277
135	4.04	0.70	160	275
139	3.95	0.62	160	272

Table 27 - Tidal Constants for O1 Constituent (continued)

South Side Barrow Strait

For Solid Ice Period (Jan. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	2.16	0.22	177	284
15	2.87	0.08	164	274
19	3.25	0.63	157	272
23	3.78	0.44	153	262
27	3.78	0.21	160	271
31	3.70	0.19	158	274
35	2.86	0.34	148	277
39	2.87	0.21	141	266
43	3.02	0.29	141	264
47	2.92	0.38	145	268
51	2.92	0.35	144	270
55	3.22	0.22	143	270
59	3.49	0.15	146	272
63	3.66	0.06	146	274
67	3.85	0.11	145	274
71	3.96	0.14	144	272
75	2.25	-0.38	67	278
79	4.03	-0.30	141	266
83	4.79	-0.23	149	267
87	5.68	-0.21	151	268
91	5.60	0.00	150	268
95	5.26	0.20	150	267
99	5.22	0.20	151	270
103	5.16	0.17	153	271
107	5.19	0.29	156	273
111	5.27	0.49	158	275
115	5.12	0.58	159	275
119	4.79	0.65	161	275
123	4.81	0.90	161	274
127	5.18	0.94	162	274
131	5.61	0.83	164	275
135	5.64	0.66	167	273
139	5.31	0.68	170	270

Table 27 - Tidal Constants for O1 Constituent (continued)

South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 25, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	4.87	-0.52	167	303
15	5.02	-0.71	166	302
19	5.08	-0.90	163	302
23	5.20	-0.70	165	301
27	5.24	-0.48	166	299
31	5.13	-0.45	168	300
35	5.20	-0.52	167	302
39	5.34	-0.44	166	302
43	5.47	-0.52	164	302
47	5.61	-0.58	163	301
51	5.54	-0.45	163	300
55	5.50	-0.40	164	299
59	5.66	-0.42	163	300
63	5.69	-0.42	163	299
67	5.71	-0.34	162	298
71	5.79	-0.27	160	298

For Solid Ice Period (Feb. 7, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	3.14	0.38	183	292
15	3.81	0.40	181	282
19	4.25	0.26	180	288
23	4.64	-0.06	179	285
27	4.67	-0.14	176	295
31	4.81	0.07	173	305
35	5.01	-0.01	167	304
39	4.90	-0.01	163	302
43	4.89	0.06	165	302
47	4.92	0.03	164	302
51	4.79	0.11	164	301
55	4.69	0.23	165	301
59	4.61	0.22	165	297
63	4.69	0.28	166	294
67	4.61	0.14	167	292
71	4.47	0.07	166	293

Table 27 - Tidal Constants for O1 Constituent (continued)

Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 23, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	6.06	-0.74	164	310
14	6.01	-1.01	166	310
18	5.86	-1.10	166	310
22	5.79	-1.18	165	309
26	5.84	-1.23	164	310
30	5.81	-1.32	164	311
34	5.85	-1.31	166	312
38	5.83	-1.29	167	312
42	5.79	-1.34	167	312
46	5.70	-1.31	167	313
50	5.76	-1.32	166	314
54	5.85	-1.30	166	314
58	5.79	-1.24	167	314
62	5.80	-1.21	166	316
66	5.79	-1.15	166	317
70	5.74	-1.12	167	318

For Solid Ice Period (Feb. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				
70				

Table 27 - Tidal Constants for O1 Constituent (continued)

North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 – Oct. 1, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	4.25	-0.16	155	287
14	4.23	-0.13	155	287
18	4.25	-0.12	157	285
22	4.16	0.03	157	278
26	3.82	0.01	155	273
30	3.52	0.24	152	265
34	3.77	0.35	154	263
38	4.07	0.37	155	263
42	4.11	0.49	156	263
46	4.23	0.52	156	262
50	4.31	0.40	154	260
54	4.31	0.37	154	259
58	4.38	0.41	153	259
62	4.57	0.40	153	260
66	4.59	0.34	153	261
70	4.25	-0.16	155	287

For Solid Ice Period (Feb. 19, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				

Table 28 - Tidal Constants for P1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 28, 2002 – Nov. 9, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	5.21	-1.37	137	22
15	3.70	-1.37	140	4
19	2.95	-0.80	158	347
23	2.74	-0.46	154	343
27	2.29	-0.31	157	333
31	2.54	-0.38	163	332
35	2.85	-0.26	165	339
39	3.34	-0.24	165	345
43	3.32	-0.23	168	349
47	3.36	-0.16	178	353
51	3.58	-0.45	179	358
55	3.55	-0.49	178	357
59	3.18	-0.26	173	356
63	2.92	-0.24	169	351
67	2.75	-0.48	165	343
71	2.76	-0.60	165	335
75	3.27	-0.64	158	336
79	3.03	-0.65	159	336
83	3.12	-0.70	157	337
87	3.34	-0.74	153	337
91	3.55	-0.62	150	335
95	3.74	-0.43	152	330
99	3.85	-0.19	154	326
103	3.88	0.02	155	325
107	4.09	0.32	157	326
111	4.21	0.39	158	330
115	4.00	0.47	160	334
119	3.73	0.62	162	335
123	3.71	0.78	164	336
127	3.95	0.85	169	338
131	4.05	0.79	171	340
135	4.11	0.71	171	339
139	4.22	0.87	170	333

Table 28 - Tidal Constants for P1 Constituent (continued)

South Side Barrow Strait

For Solid Ice Period (Jan. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	2.34	1.56	253	288
15	1.87	1.13	267	314
19	2.89	-1.05	214	318
23	5.61	-0.01	193	300
27	6.40	0.22	185	295
31	5.51	0.56	182	293
35	4.76	0.42	176	304
39	4.77	0.38	173	306
43	4.98	0.54	169	304
47	4.91	0.54	166	303
51	5.17	0.35	159	297
55	5.19	0.43	156	294
59	4.99	0.37	153	294
63	5.29	0.06	152	293
67	5.58	0.10	157	293
71	5.49	0.22	158	294
75	8.97	-3.75	183	182
79	3.63	-3.31	231	334
83	3.57	-0.81	131	303
87	5.22	-0.38	152	317
91	5.86	0.01	155	319
95	6.58	-0.25	156	313
99	7.10	0.14	156	317
103	7.36	-0.22	158	322
107	7.68	-0.36	160	326
111	8.04	-0.09	161	327
115	8.41	0.29	162	324
119	8.77	0.46	167	322
123	9.13	0.33	168	316
127	9.61	-0.41	168	316
131	9.88	-0.50	170	320
135	10.26	0.38	179	326
139	9.78	0.94	187	326

Table 28 - Tidal Constants for P1 Constituent (continued)

South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 25, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	3.21	-0.33	140	325
15	3.53	-0.76	146	323
19	3.51	-0.46	152	314
23	3.23	0.19	150	322
27	3.37	0.01	162	341
31	3.80	-0.40	162	345
35	3.66	-0.32	163	344
39	3.95	-0.10	160	342
43	3.76	0.10	157	342
47	3.81	0.01	155	345
51	4.13	0.14	158	343
55	4.27	0.13	158	344
59	4.26	0.02	157	348
63	3.89	-0.19	156	346
67	3.77	-0.22	157	340
71	3.74	-0.12	155	336

For Solid Ice Period (Feb. 7, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11 15 19 23 27	Up to 30% of data missing at these depths, results unreliable.			
31	4.39	0.42	175	338
35	3.92	0.74	180	348
39	3.93	0.25	189	350
43	3.60	0.08	190	346
47	4.09	-0.30	194	346
51	4.20	-0.29	195	345
55	3.62	-0.21	197	344
59	3.47	-0.71	188	343
63	3.45	-0.68	183	346
67	3.20	-0.80	187	342
71	3.03	-0.68	193	344

Table 28 - Tidal Constants for P1 Constituent (continued)

Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 23, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	3.33	0.31	145	348
14	2.76	0.67	161	2
18	3.11	0.37	165	3
22	3.56	-0.33	164	357
26	3.35	-0.70	161	357
30	3.37	-0.94	158	357
34	3.74	-1.32	160	2
38	3.97	-1.23	165	359
42	4.01	-1.15	169	355
46	3.98	-1.17	171	355
50	3.85	-1.12	171	359
54	3.68	-1.03	170	2
58	3.83	-0.85	166	6
62	3.65	-0.70	166	5
66	3.54	-0.60	167	2
70	3.48	-0.44	169	2

For Solid Ice Period (Feb. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				
70				

Table 28 - Tidal Constants for P1 Constituent (continued)

North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 – Oct. 1, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	2.76	0.36	70	208
14	2.75	0.68	113	270
18	2.28	-0.24	86	265
22	1.60	-1.20	98	215
26	1.85	-0.97	151	328
30	2.52	-0.86	173	288
34	2.91	-0.47	157	284
38	3.26	-0.74	153	291
42	3.25	-0.54	154	293
46	3.25	-0.35	153	296
50	3.32	-0.30	149	302
54	3.22	-0.31	147	304
58	2.95	-0.21	154	306
62	2.95	-0.27	160	311
66	2.83	-0.24	159	307
70	2.76	0.36	70	208

For Solid Ice Period (Feb. 19, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				

Table 29 - Tidal Constants for S2 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 28, 2002 – Nov. 9, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	3.89	-0.52	161	244
15	4.36	-0.57	157	245
19	4.60	-0.82	160	248
23	4.59	-0.96	162	246
27	4.71	-1.04	161	247
31	4.50	-0.95	159	247
35	4.37	-0.93	158	248
39	4.14	-0.76	161	246
43	3.70	-0.62	163	247
47	3.44	-0.75	164	248
51	3.38	-0.66	163	247
55	3.46	-0.46	164	247
59	3.40	-0.01	164	246
63	3.30	0.31	165	247
67	3.24	0.33	166	248
71	3.11	0.22	171	252
75	3.27	-0.02	171	257
79	3.66	-0.02	171	256
83	3.87	-0.12	171	255
87	4.06	-0.13	170	253
91	4.08	-0.19	170	251
95	4.11	-0.22	170	251
99	4.15	-0.19	169	252
103	4.17	-0.14	165	253
107	4.35	-0.22	162	255
111	4.50	-0.26	160	259
115	4.46	-0.24	160	261
119	4.45	-0.21	162	264
123	4.27	-0.19	164	266
127	4.09	0.06	167	266
131	4.00	0.44	169	267
135	3.81	0.63	170	268
139	3.65	0.83	170	266

Table 29 - Tidal Constants for S2 Constituent (continued)

South Side Barrow Strait

For Solid ice Period (Jan. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	1.61	0.38	157	285
15	2.12	-0.22	171	230
19	2.67	-0.32	180	205
23	3.78	-0.53	168	237
27	4.48	-0.20	171	248
31	4.73	-0.47	167	245
35	3.93	-0.77	167	246
39	3.83	-0.95	170	244
43	3.81	-0.91	170	242
47	3.79	-0.94	168	246
51	3.91	-0.88	168	247
55	4.04	-0.80	168	247
59	4.16	-0.85	170	247
63	4.08	-0.86	172	248
67	3.94	-0.90	172	250
71	3.85	-0.89	170	252
75	2.90	-0.71	177	303
79	3.05	-1.02	159	288
83	4.35	-0.71	169	265
87	4.88	-0.75	162	254
91	4.76	-0.77	157	246
95	4.22	-0.64	151	249
99	3.98	-0.33	148	249
103	3.87	-0.18	147	249
107	3.79	-0.10	146	248
111	3.77	0.00	150	249
115	3.86	0.13	156	249
119	3.87	0.42	160	254
123	4.04	0.52	170	264
127	4.15	0.29	179	269
131	4.25	0.09	182	270
135	4.39	0.08	181	268
139	4.03	0.40	180	266

Table 29 - Tidal Constants for S2 Constituent (continued)

South Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 25, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	4.95	-0.81	154	224
15	5.74	-1.63	153	223
19	6.74	-2.33	157	230
23	7.02	-2.56	161	238
27	6.84	-2.29	163	244
31	6.61	-1.80	167	247
35	6.33	-1.79	170	251
39	6.31	-1.86	171	253
43	6.09	-1.79	171	255
47	5.97	-1.65	173	255
51	5.99	-1.61	174	256
55	5.86	-1.66	176	256
59	5.65	-1.50	178	256
63	5.46	-1.28	176	257
67	5.32	-1.04	175	257
71	5.05	-1.03	175	256

For Solid Ice Period (Feb. 7, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	2.07	-0.21	177	249
15	3.82	-0.34	177	255
19	3.89	-0.53	174	258
23	4.28	-0.89	171	259
27	4.03	-0.96	170	256
31	4.22	-0.86	173	252
35	4.20	-0.65	173	257
39	4.07	-0.71	174	257
43	4.07	-0.78	171	260
47	4.24	-0.76	168	262
51	4.43	-0.89	172	262
55	4.54	-1.10	174	263
59	4.69	-1.22	174	261
63	4.59	-1.19	174	261
67	4.42	-1.16	172	262
71	4.41	-1.07	172	258

Table 29 - Tidal Constants for S2 Constituent (continued)

Central Barrow Strait

For Ice Free Period (Aug. 20, 2002 – Oct. 23, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	4.99	-1.11	162	240
14	5.27	-1.34	161	239
18	5.90	-1.88	160	237
22	6.99	-2.81	160	238
26	7.60	-3.47	162	240
30	7.60	-3.45	163	241
34	7.16	-3.00	164	239
38	6.77	-2.54	163	240
42	6.42	-2.11	165	242
46	6.21	-1.94	168	244
50	5.96	-1.77	171	246
54	5.75	-1.63	172	247
58	5.56	-1.44	173	248
62	5.29	-1.32	174	250
66	5.21	-1.45	175	252
70	5.19	-1.39	176	253

For Solid Ice Period (Feb. 24, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				
70				

Table 29 - Tidal Constants for S2 Constituent (continued)

North Side Barrow Strait

For Ice Free Period (Aug. 19, 2002 – Oct. 1, 2002):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	4.63	-0.49	162	236
14	5.39	-1.08	163	239
18	5.53	-1.19	167	240
22	5.49	-1.13	169	241
26	5.65	-1.28	169	238
30	5.70	-1.39	169	234
34	5.70	-1.43	166	232
38	5.70	-1.24	164	230
42	5.69	-1.21	164	229
46	5.64	-1.19	165	231
50	5.50	-0.99	165	232
54	5.24	-0.88	165	233
58	5.00	-0.69	165	233
62	4.82	-0.37	164	233
66	4.65	-0.21	164	233
70	4.63	-0.49	162	236

For Solid Ice Period (Feb. 19, 2003 – Mar. 15, 2003):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10				
14				
18				
22				
26				
30				
34	**Insufficient period for analysis**			
38				
42				
46				
50				
54				
58				
62				
66				