MOORED INSTRUMENT OBSERVATIONS FROM BARROW STRAIT, 2007-2008

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Abstract

Pettipas, R. and J. Hamilton. 2013. Moored instrument observations from Barrow Strait, 2007-2008. Can. Data Rep. Hydrogr. Ocean Sci 193: vi + 100 p.

Instrumented moorings deployed in the eastern end of Barrow Strait from August 2007 to August 2008 provide yearlong records of current, temperature, salinity and ice drift extending a data time series started in August of 1998. The presented current and ice drift data have been collected with acoustic Doppler current profilers (ADCPs) and specialised instrumentation for near-pole direction measurement. Temperature, salinity and density for fixed depths from moored CTDs are also presented, as well as yearlong daily upper ocean profiles of temperature, salinity, fluorescence and dissolved oxygen collected with the Icycler moored profiler. The current and CTD data are presented as filtered and unfiltered time series, spectral and tidal analyses products, and in statistical summaries.

Résumé

Pettipas, R. and J. Hamilton. 2013. Observations des instruments amarrés dans le détroit de Barrow, 2007-2008. Can. Data Rep. Hydrogr. Ocean Sci. 193: vi + 100 p.

Les amarrages équipés installés à l'extrémité est du détroit de Barrows d'août 2007 à août 2008 ont fourni des enregistrements tout au long de l'année du courant, de la température, de la salinité et de la dérive des glaces, prolongeant ainsi une série chronologique de données qui a commencé en août 1998. Les données présentées sur le courant et la dérive des glaces ont été recueillies à l'aide de profileurs de courant à effet Doppler (ADCP) et d'instruments spécialisés pour la mesure de la direction à proximité des pôles. Les enregistrements de la température, de la salinité et de la densité pour les profondeurs fixes effectués par les sondes CTP amarrées, ainsi que les profils quotidiens en couche supérieure des océans de la température, de la salinité, de la fluorescence et de l'oxygène dissous recueillis tout au long de l'année par le profileur amarré Icycler, sont également présentés. Les données sur le courant et les données de CTP sont présentées sous la forme de séries chronologiques filtrées et non filtrées, de produits d'analyse spectrale et d'analyse de la marée, et de résumés statistiques.

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), was started by BIO investigators in August of 1998. Data from the first 9 years of this study, along with a description of the methods used, have previously been reported [Pettipas and Hamilton, 2013, Pettipas et al., 2010, 2008, 2006, 2005; Hamilton et al., 2008, 2004, 2003, 2002]. Described here are moored instrument data from the tenth year of the study.

Yearlong records of temperature, salinity and density information derived from moored Microcat CTD data are presented as unfiltered and low-pass filtered time series, and also as power spectra. Current rate and direction (from ADCPs and custom pole compasses) are presented as progressive vector plots, unfiltered and low-pass filtered contour plots, and as time series plots for depths corresponding to the moored CTDs. Seasonally averaged statistical summaries for both the CTD and current data are provided as graphs and in tabular form. Results of tidal analyses of the current data 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 immobile, solid ice cover and periods of open water.

Ice drift velocity, obtained from the acoustic Doppler current profilers (ADCPs), are presented as yearlong time series. A year of daily profiles of temperature, salinity, fluorescence and dissolved oxygen over the top 45 m of the water column are also presented. These data were collected with the moored profiler Icycler (described in Fowler et al. [2004]), providing a second year of comprehensive upper ocean profile data from the southern side of Barrow Strait, the first year being 2003 – 2004 [Hamilton et al., 2008].

Mooring Locations and Description

Three instrumented moorings were located at each of 2 sites on the South side of Barrow Strait (Figure 1) to provide the data required for extending the volume,

freshwater and heat transport time series started in 1998. Although 4 sites across the strait were instrumented in earlier years, analysis of the data from those years indicated that transports are almost entirely confined to the southern half of the strait, so monitoring at just the 2 locations (the South and South-Central sites) was sufficient for estimating transports.

ADCPs manufactured by Teledyne RD Instruments and precision heading references (Watson Industries, Inc.) 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 [2004, 2001]. The 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 throughout the yearlong deployments. 307 kHz Workhorse Sentinel ADCPs (WHADCPs) were used at both the South and South-Central sites for sampling over the top 70 m. At the South-Central site a 75 kHz Long Ranger ADCP (LRADCP) was also used, to measure currents over almost the entire water column (from 20 m to 225 m depth). Concurrent direction measurements were logged separately with the precision heading reference systems, and have been merged with the ADCP speed data for presentation here. All 3 ADCP/compass systems were successfully recovered with full data sets. One potential issue with LRADCP data quality is presented by a bug in the manufacturer's firmware that prevented a tilt compensation routine from properly correcting the current measurements for instrument tilt. Normally, the streamlined buoyancy packages we mount the ADCPs in remain quite level in a range of flows, so this would not be an issue, but in this case ballasting of the package was required before deployment to compensate for a failed buoyancy element. This in-the-field adjustment was not perfect, and resulted in the instrument having a 15° pitch throughout the deployment. A comparison of the LRADCP data with concurrent WHADCP data is presented which indicates the impact was relatively small, so all LRADCP data are presented without any attempt to correct them.

SeaBird Microcat CTDs were used to measure temperature, conductivity and pressure at targeted depths of 40, 80 and 150 m at both sites, as well as one near-bottom

at the South-Central site, and one just under the Icycler profiler at the South site. These CTDs recorded temperature, conductivity and pressure at a single depth every 30 minutes. All of these Microcat CTDs were recovered and returned good data except for the 80 m instrument at the South-Central site which was lost along with an Ice Profiling Sonar (IPS) also on that mooring. The recovered portion was 300 m off station, and the failure point was a wire splice near the bottom of the mooring, strongly suggesting the mooring was impacted and dragged by an iceberg until the splice failed under high tension.

An *EnviroTech Microlabs* water sampler which drew and stored a 150 ml sample every 24 days from its deployment depth of 35 m was also on one of the moorings at the South site. On recovery, samples were preserved for later analyses that included processing for oxygen isotopes used for water mass identification. These results are not reported here.

A mooring was also located in 270 m depth on the northern side of the strait (Figure 1). This mooring was deployed in 2007 and recovered in 2008 for ArcticNet colleagues, and was instrumented with an IPS, an *Aural* hydrophone, a sediment trap (200m depth) and a CTD (40 m depth). Only the CTD data are presented in this report. An illustration of the 7 moorings is shown in Figure 2.

A summary of the 2007-2008 moorings and instrumentation, including mooring positions, instrument depths and acquired data records, is presented in Table 1.

Data Processing

Current Speed and Direction Data

The 307 kHz Workhorse ADCPs (WHADCPs) 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. These instruments were set up to average over a depth interval of 4 m. The highest useful depth average in the data sets from the 2 WHADCPs 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 100% or near-100% ice cover.

A 307 kHz WHADCP was moored at both the South and South-Central sites at depths of 72 and 78 m respectively to provide currents over the upper water column. At the South-Central site where the bottom depth is 270 m, the 75 kHz Long Ranger ADCP (LRADCP) moored near bottom (240 m) provided near full water column coverage, overlapping the range of the 307 kHz unit in the top 75 m.

Direction was provided using an independent compass package mounted in the buoyancy package 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 Teledyne RDI's "RDS3 interface" to provide a turn-on pulse to the compass. The compass was programmed to take a 10 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, with the largest (exceeding 2 m only 0.3% of the time) occurring with the South-Central WHADCP mooring.

Moored CTD Data

SeaBird Microcat CTDs were set up to measure temperature, conductivity and pressure every 30 minutes for the yearlong deployments. Instrument dips due to current drag forces acting on the moorings were small. Maximum dips of the 40 m CTDs were 2 m and 6 m for the South and South-Central sites respectively, and slightly larger with the ArcticNet mooring but even in that case less than 4 m 99.2% of the time.

Low-Pass Filtering

The low-pass filtered data 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 for the bi-hourly current data, we sequentially apply 12,12, and 13 sample averaging filters, while for the semi-hourly Microcat CTD data we sequentially apply 48, 48 and 50 sample averaging filters.

Tidal Analysis

Harmonic tidal analyses of current data using Foreman's [1978] method are presented separately for the period of broken or no ice cover, and the period of immobile, consolidated ice. At the South site the open water period was Aug 1 to Oct 17, 2007 (11 weeks) while the consolidated, landfast ice period was Dec 15 to July 3, 2008 (29 weeks). At the South-Central site, the open water period was very similar (Aug 2 to Oct 20) while the period of landfast ice was a month shorter at 24 weeks (Jan 19 to July 4, 2008). Tidal ellipse axes amplitudes, orientations and phases for the main tidal constituents (K1, M2, O1, P1, 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 half-hourly sampled temperature, salinity and density from the moored CTDs are shown in Figures 3- 5. Expected late summer freshening at all three sites is observed from September through November in the upper level (~40m) CTDs. At the northern ArcticNet site, there is also a freshening and warming signal in mid-July of the following summer indicating an earlier arrival of the summer season than on the South side where this signal is not observed. Power spectra of the moored CTD measurements are shown in Figures 6 - 8. Diurnal and weaker semi-diurnal signals are observed in the South and South-Central records. At the ArcticNet site, there is more energy in the semi-diurnal band.

Current data are reported next. Tilt of the LRADCP moored at the South-Central site (Figure 9) may have had some impact on the quality of the current data because of a bug in the manufacturer's firmware, which resulted in the tilt compensation algorithm being disabled. However a comparison with the WHADCP moored nearby (Figure 10) indicates that any resulting errors were relatively small, so all data are reported here, with no correction attempted.

Yearlong progressive vector diagrams for each ADCP are shown in Figures 11-13. An eastward along-strait flow predominates in the upper water column at both the South (Figure 11) and South-Central (Figure 13) sites. The LRADCP indicates a predominantly northward flow in the lower water column (Fig 12), which was also observed at this site in previous years. Overall yearlong mean rates/directions from the South-Central instruments over the depth range for which both provide data compare reasonably well. At the ~50m level the annual mean computed from the progressive vector plots for the LRADCP (Figure 12) and the WHADCP (Figure 13) are 4.1 cm/s @ 56° and 4.0 cm/s @ 69° respectively. At ~20m, we calculate 4.7 cm/s @ 47° and 5.1 cm/s @ 78°.

A month of bihourly current data are presented as along-strait and cross-strait components for each ADCP in Figures 14-16, where positive values are defined as flow towards 105° true and 15° true, respectively. These figures reveal the strong tidal nature of the flow. Yearlong records of low-pass filtered data (tides removed) for the 3

instruments are shown in Figures 17-19. Mean flow in the upper water column is predominantly eastward at both sites as in previous years, but the weakest observed since the observational program began in 1998.

Yearlong records of salinity, temperature, fluorescence and dissolved oxygen from the moored profiler, Icycler are shown in Figure 20. From August to the end of October, water in the top 20 m at the Southern site was up to 2.5 psu fresher than at the 40 m level. However, this summer layer was only about half as thick as observed with Icycler in 2003-2004 [Hamilton et al., 2008]. Also, in 2003-2004 this fresher near-surface layer persisted through fall and into winter whereas in 2007-2008 there was no fresh near-surface layer after mid-November. The temperature records in the 2 years are also quite different. Near-surface water temperatures over the late summer period were as high as 4°C in 2007, but never exceeded -0.5°C in late summer, 2003. Fluorescence was measured with a pumped WetLabs WS3S fluorometer integrated with the pumped SBE-19plus CTD system on the Icycler sensor float. Values of 14 mg/m^3 and higher are shown as dark red in Figure 20. The Icycler fluorescence record from 2007-2008 indicated that the spring bloom did not occur until mid-July, whereas in 2003-2004 it commenced around June 1 (6 weeks earlier). The ice departed much earlier in 2003-2004 as well. Also shown in Figure 20 are data from a pumped Sea-Bird SBE43 dissolved oxygen sensor that was also part of the Icycler instrument suite. No in situ oxygen sampling to calibrate and verify these Icycler dissolved oxygen measurements was done.

Smoothed temperature, salinity and current data (where available) are shown for each moored CTD level in Figures 21-29. Tables 2 through 19 provide a summary of the CTD and ADCP data at the CTD depths, with statistics computed over each season, and for the entire year. For the South-Central site, WHADCP data are reported in the tables for the 36 and 72m levels, while LRADCP data are reported for the deeper levels (159 and 223 m). Density has been included in these statistical summaries.

Annual and seasonal mean flows are summarised in Figures 30-35. Each 4 m binned value for the WHADCPs (8 m for the LRADCP) is shown except for WHADCP data from the bins centered at 40 and 44 m depth at the South-Central site, which were not reported because of acoustic contamination at this level created by the buoyancy package at the top of the mooring. Annual and seasonal along-strait mean currents at

both the South and South-Central sites in 2007-2008 are the lowest observed since the start of the program in 1998. Significant cross-strait currents at the South-Central site are evident. The variance in the bi-hourly, and low-pass filtered current data for the yearlong ADCP records are shown in Figure 36. At the South site, tides account for half of the total variance in the along-strait current speeds, while at the South-Central site, tides account for ¾ of the variance near the surface to virtually all of the variance near bottom.

Tidal analysis results for each of the 3 ADCP data sets are presented as profiles for the 5 largest tidal constituents in Figures 37 – 51. Separate analyses have been done for open water and immobile ice-covered periods. K1 and M2 constituents are similar in magnitude. Effects of frictional effects caused by the ice cover are observed near-surface in some of the profiles. Ellipse orientations are along-strait as expected. Tidal constants are summarised in Tables 20 – 24.

Ice velocities through the year at both sites were derived from the WHADCPs (Figures 52 and 53). Sections in the record when there are no data indicate periods of open water, or partial ice cover as determined by applying the manufacturer's suggested data quality standards to the ice velocity data. In addition, the ice drift velocity estimate and the adjacent estimates were rejected when the magnitude of the "error velocity" for a particular ensemble was greater than 1 cm/s. The period of landfast ice (29 weeks at the South site and 24 weeks at the South-Central site) was the longest of any winter since the start of the observational program in 1998.

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References

Foreman, M.G.G., 1978. *Manual for tidal currents analysis and prediction*. Pacific Marine Science Report 78-6. Institute of Ocean Sciences, Sidney, B.C., 70pp.

Fowler, G.A., G.R. Siddall and S.J. Prinsenberg, 2004. *An energy-conserving oceanographic profiler for use under mobile ice cover: ICYCLER.* International Journal of Offshore and Polar Eng., Vol. 14(3), pp 176 – 181.

Godin, G, 1972. *The Analysis of Tides*. Liverpool: Liverpool University Press, 264pp.

Hamilton, J.M. 2004. *Accurate current directions from instrumented arctic moorings, in* Arctic/SubArctic Ocean Fluxes Newsletter, issue 2, 8-11.

Hamilton, J., R. Pettipas and S. Prinsenberg. 2008. Moored current meter and CTD observations from Barrow Strait, 2003-2004. Can. Data Rep. Hydrogr. Ocean Sci. 173 : vi + 134 p.

Hamilton, J., S. Prinsenberg and L. Malloch. 2004. Moored current meter and CTD observations from Barrow Strait, 2000-2001. Can. Data Rep. Hydrogr. Ocean Sci. 165 : v + 59 p.

Hamilton, J., S. Prinsenberg and L. Malloch. 2003. Moored current meter and CTD observations from Barrow Strait, 1999-2000. Can. Data Rep. Hydrogr. Ocean Sci. 161 : v + 60 p.

Hamilton, J., S. Prinsenberg and L. Malloch. 2002. Moored current meter and CTD observations from Barrow Strait, 1998-1999. Can. Data Rep. Hydrogr. Ocean Sci. 157 : v + 65 p.

Hamilton, J. M., 2001. Accurate Ocean Current Direction Measurements Near the Magentic Poles, in *Proceedings of the Eleventh (2001) International Offshore and Polar Engineering Conference*, 656-660. ISOPE: Stavanger, Norway.

Pettipas, R. and J. Hamilton. 2013. Moored instrument and CTD observations from Barrow Strait, 2006-2007. Can. Data Rep. Hydrogr. Ocean Sci. 192 : vi + 98 p.

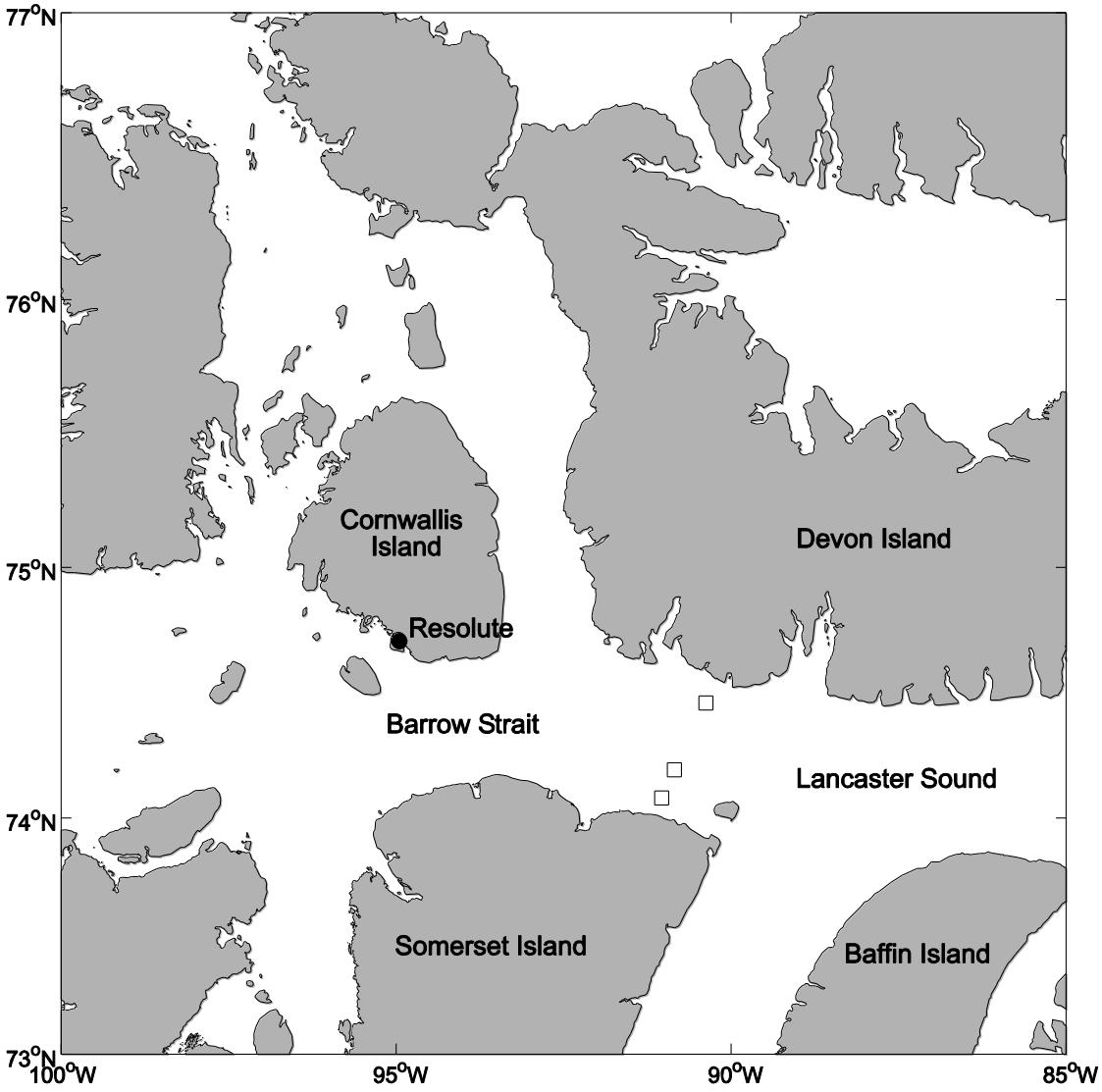
Pettipas, R., J. Hamilton, and S. Prinsenberg. 2010. Moored instrument observations from Barrow Strait, 2005-2006. Can. Data Rep. Hydrogr. Ocean Sci. 190 : vii + 139 p.

Pettipas, R., J. Hamilton, and S. Prinsenberg. 2008. Moored current meter and CTD observations from Barrow Strait, 2004-2005. Can. Data Rep. Hydrogr. Ocean Sci. 174 : vi + 135 p.

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.

Pettipas, R., J. Hamilton and S. Prinsenberg. 2005. Moored current meter and CTD observations from Barrow Strait, 2001-2002. Can. Data Rep. Hydrogr. Ocean Sci. 166 : v + 118 p.

Figure 1: A map of the work area showing the location of the mooring sites as the open boxes, which from South to North represent the South, South-Central and ArcticNet mooring sites.



<u>Figure 2</u>: Illustration of the instrumented moorings.

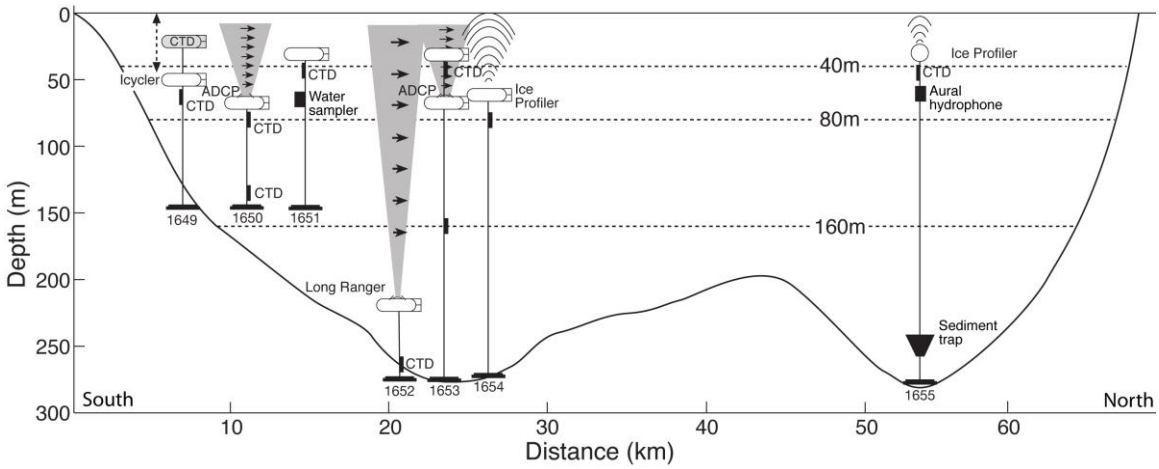


Figure 3: Moored 30 min. CTD data, South Side Barrow Strait. August 2007 – August 2008

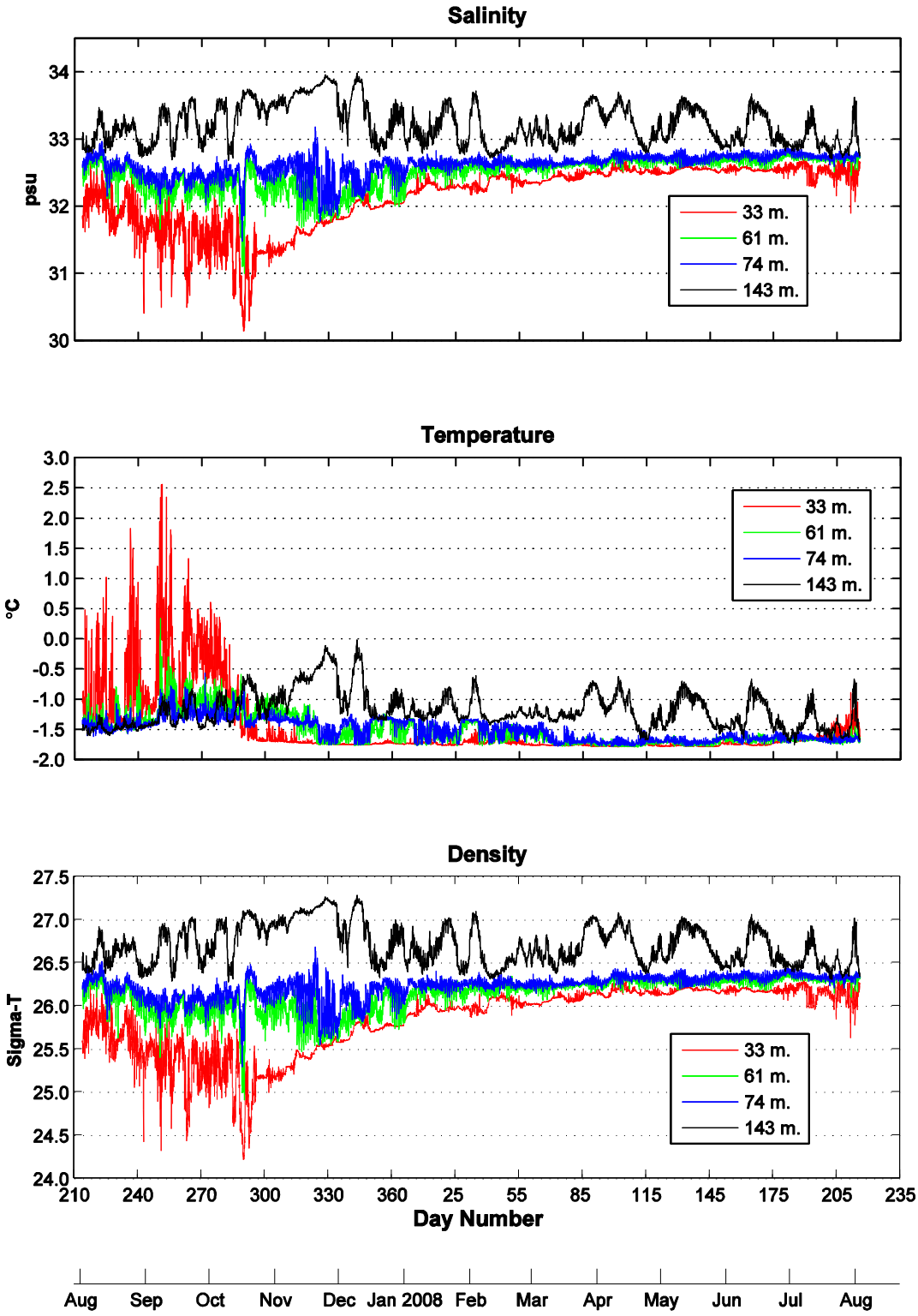


Figure 4: Moored 30 min. CTD data, South-Central Barrow Strait. August 2007 – August 2008

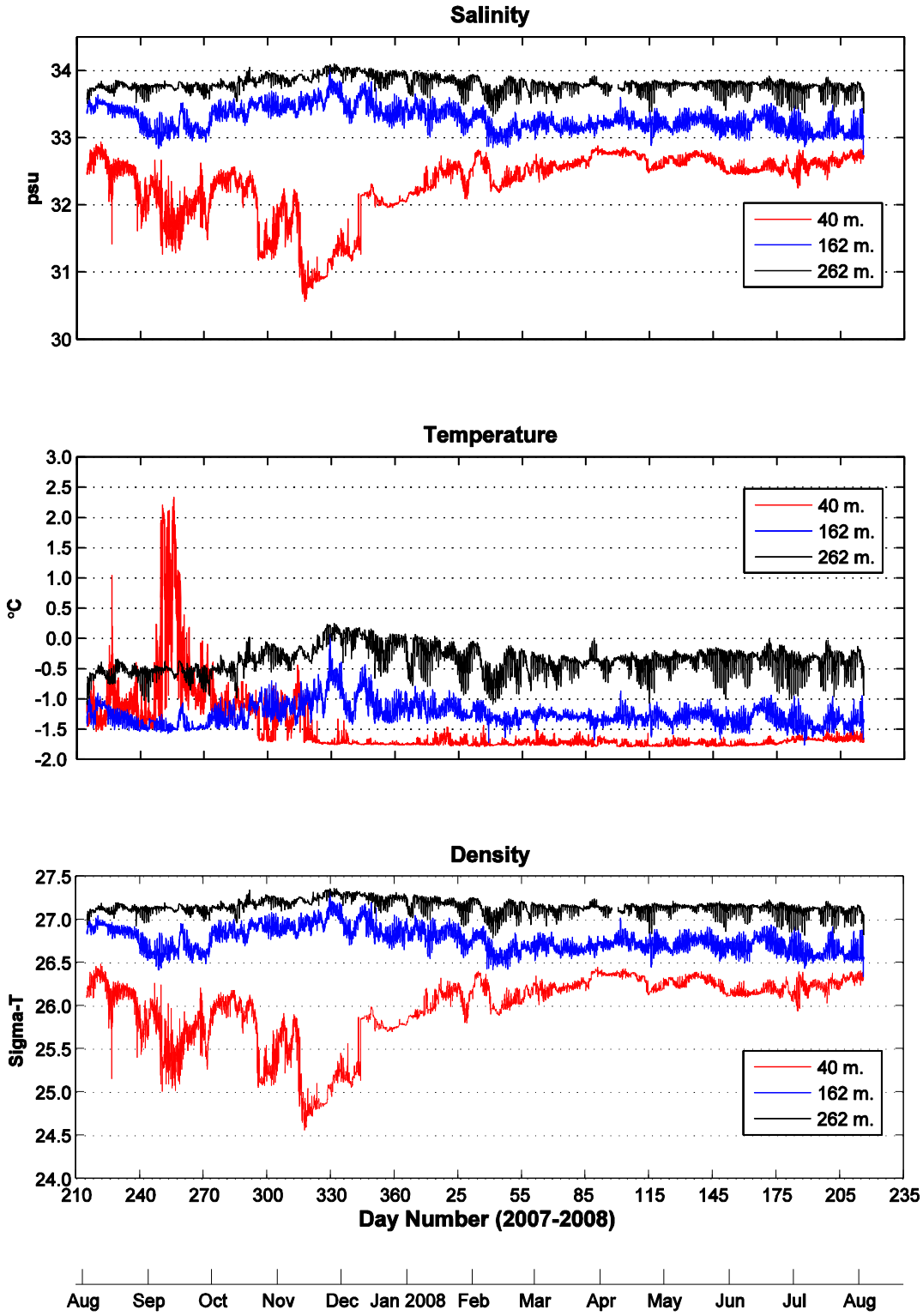


Figure 5: Moored 30 min. CTD data, ArcticNet Mooring.
August 2007 – August 2008

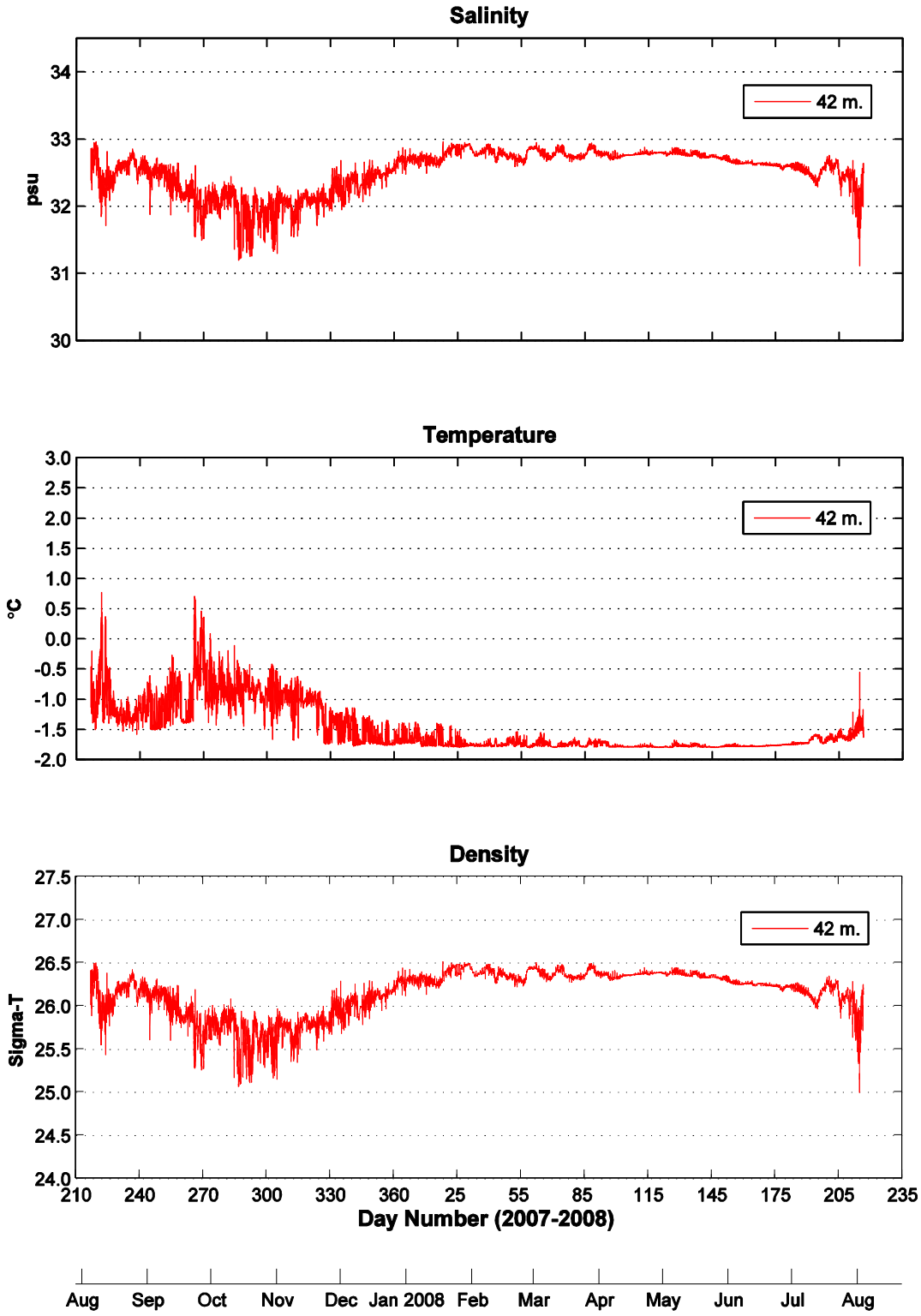


Figure 6: Power Spectra of moored bi-hourly CTD data. South Side Barrow Strait: Aug. 2007 – Aug. 2008.

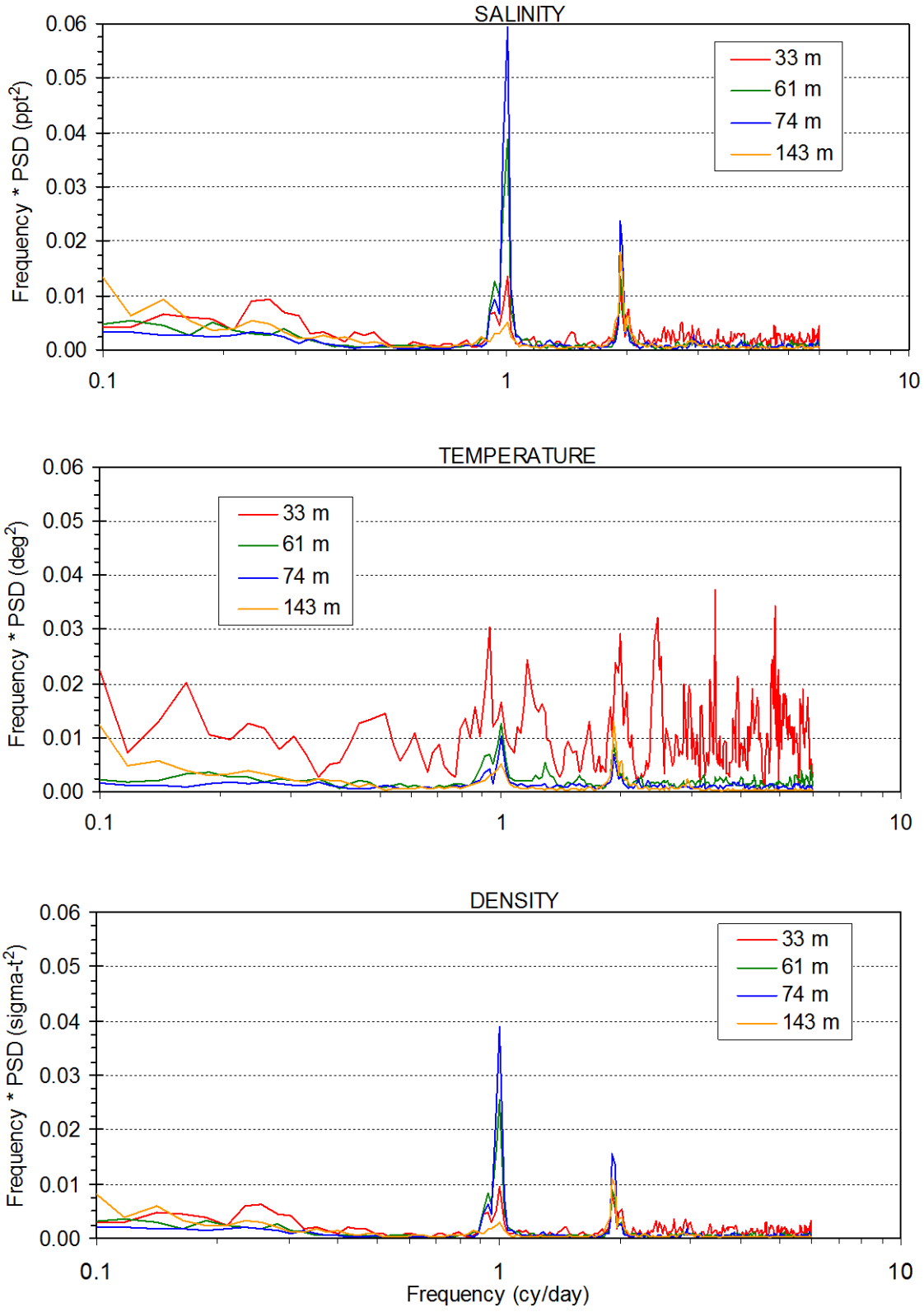


Figure 7: Power Spectra of moored bi-hourly CTD data. South-Central Barrow Strait: Aug. 2007 – Aug. 2008.

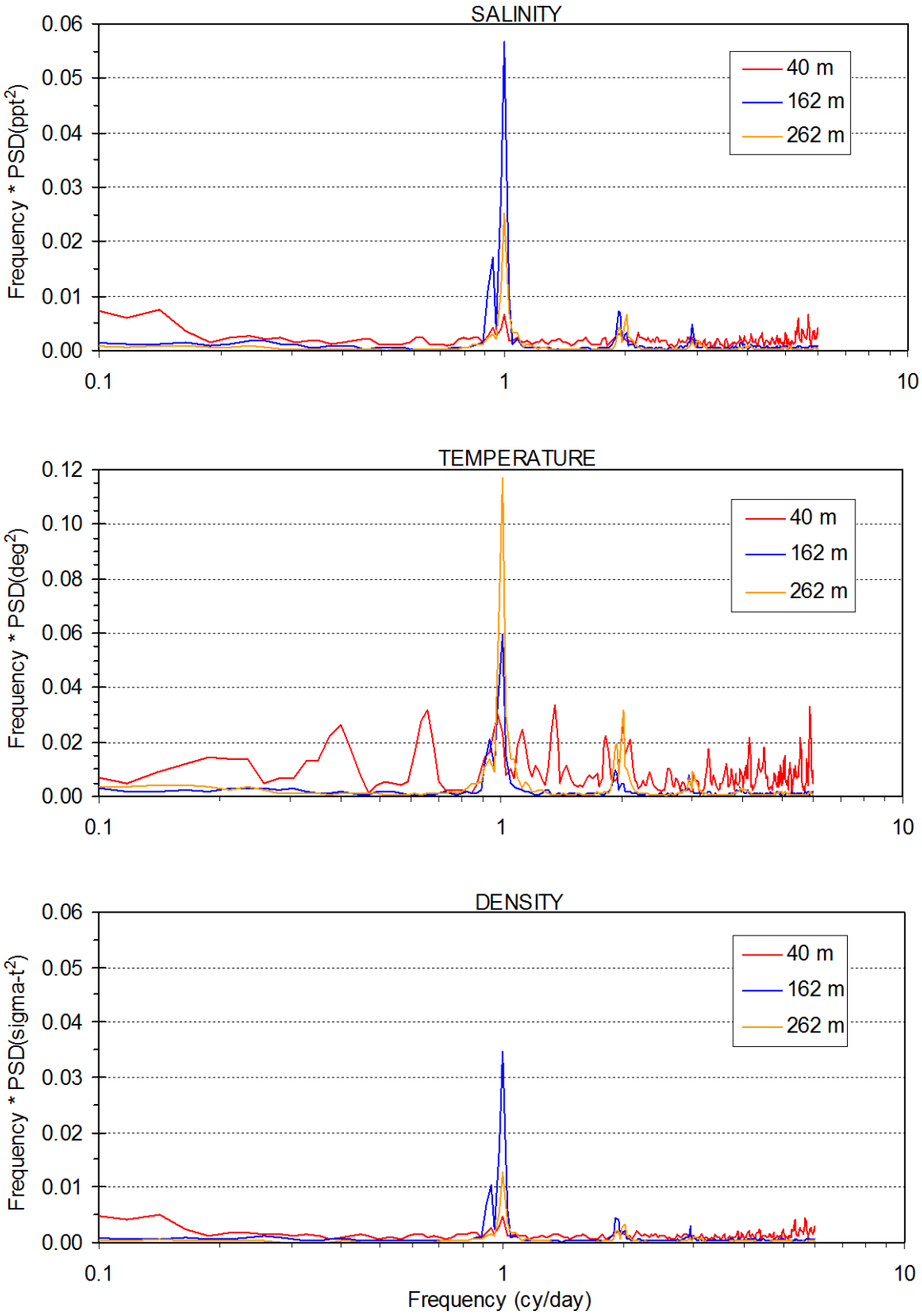


Figure 8: Power Spectra of moored bi-hourly CTD data. ArcticNet Mooring: Aug. 2007 – Aug. 2008.

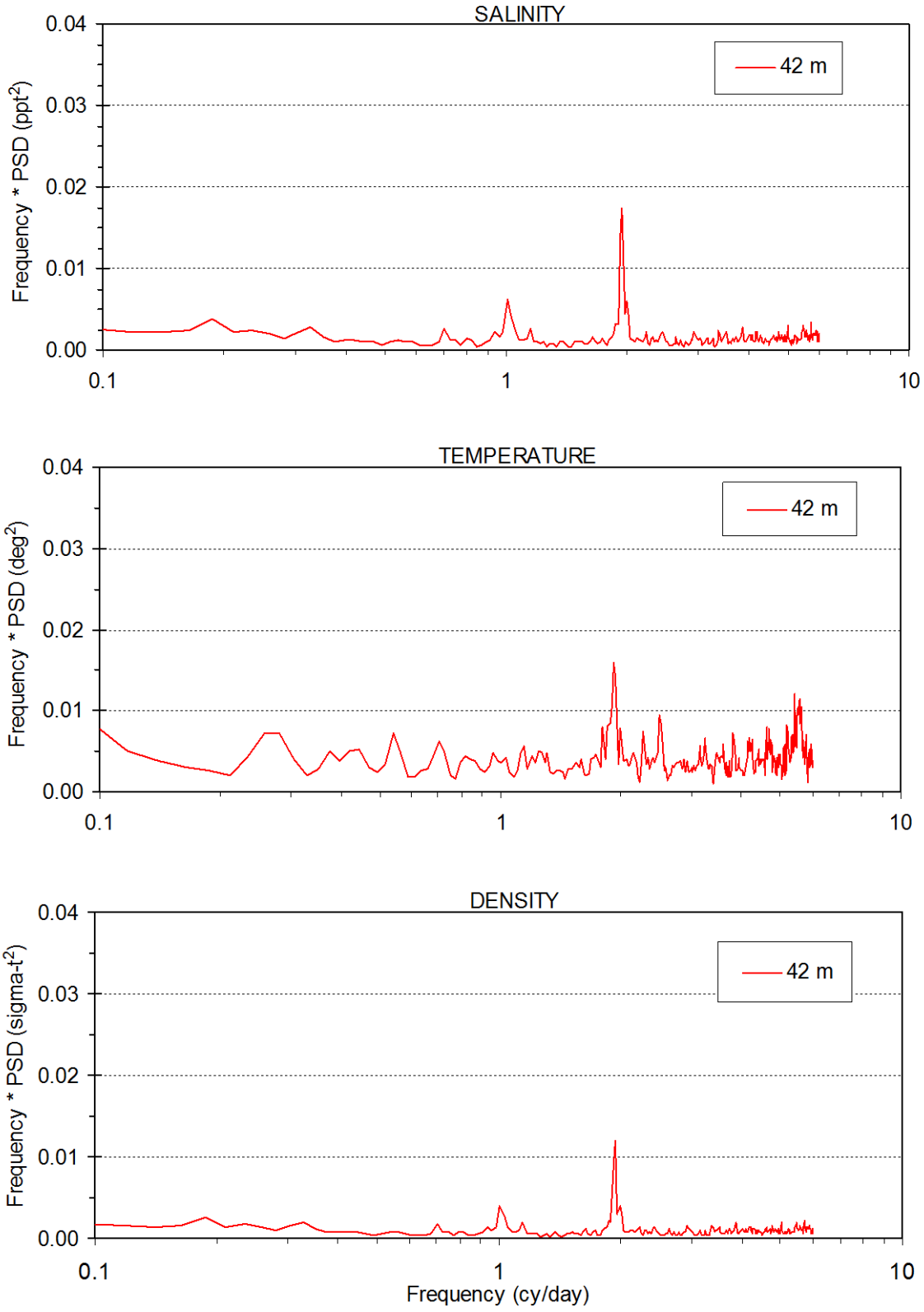


Figure 9: South-Central Barrow Strait:
Tilts of Long Ranger ADCP as measured with Pole Compass #146 on Mooring M1652

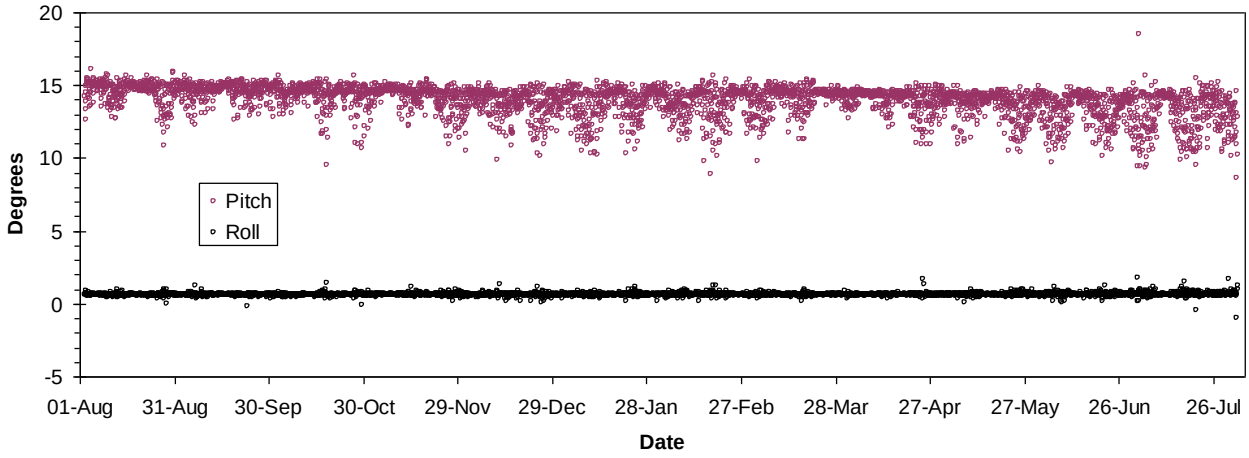


Figure 10: South-Central Barrow Strait, Long Ranger vs. Workhorse ADCP Overall Mean Velocities, August 2007- August 2008

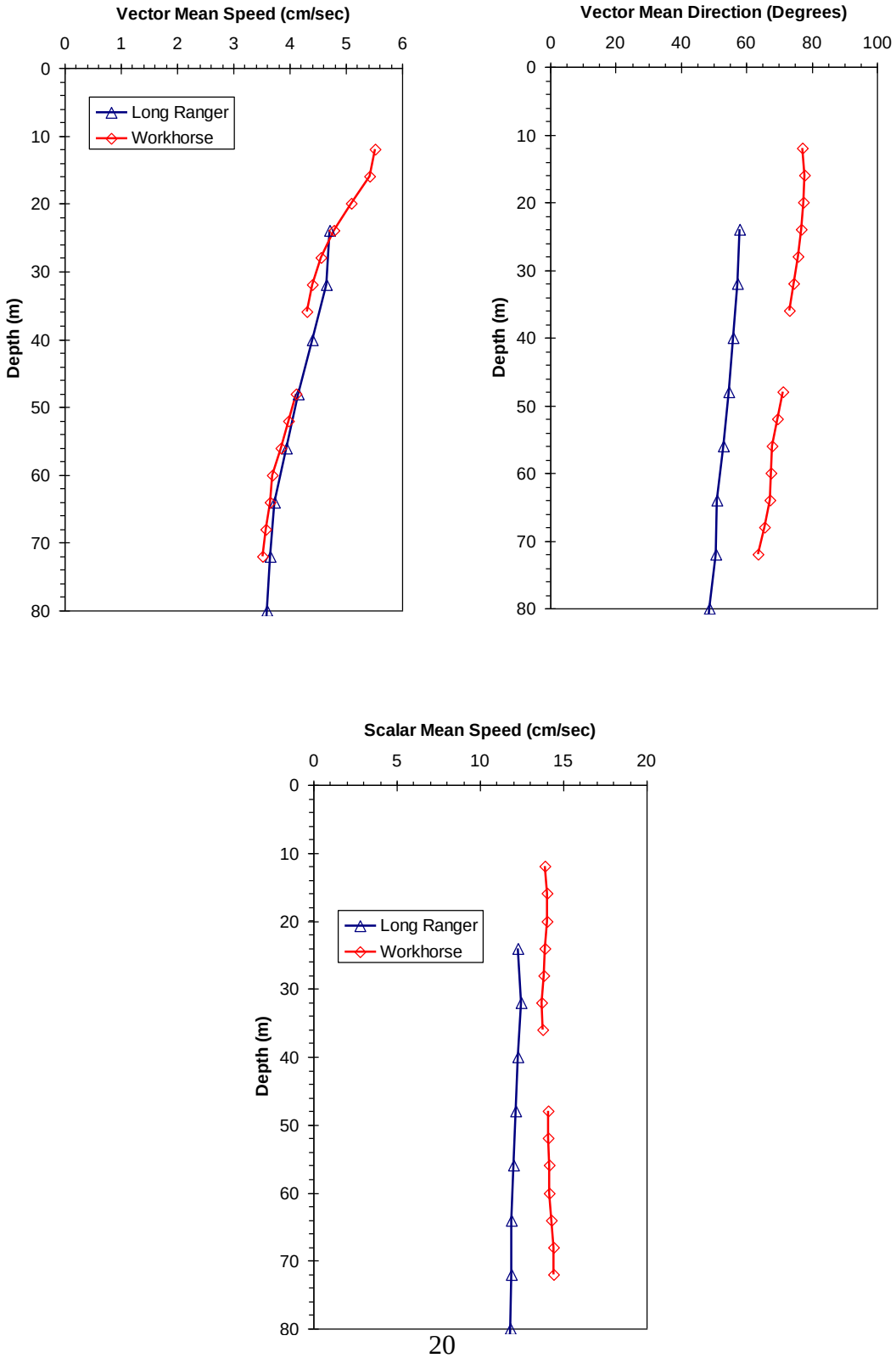


Figure 11: Progressive Vector Diagram, South Side Barrow Strait. Aug. 1, 2007 – Aug. 2, 2008

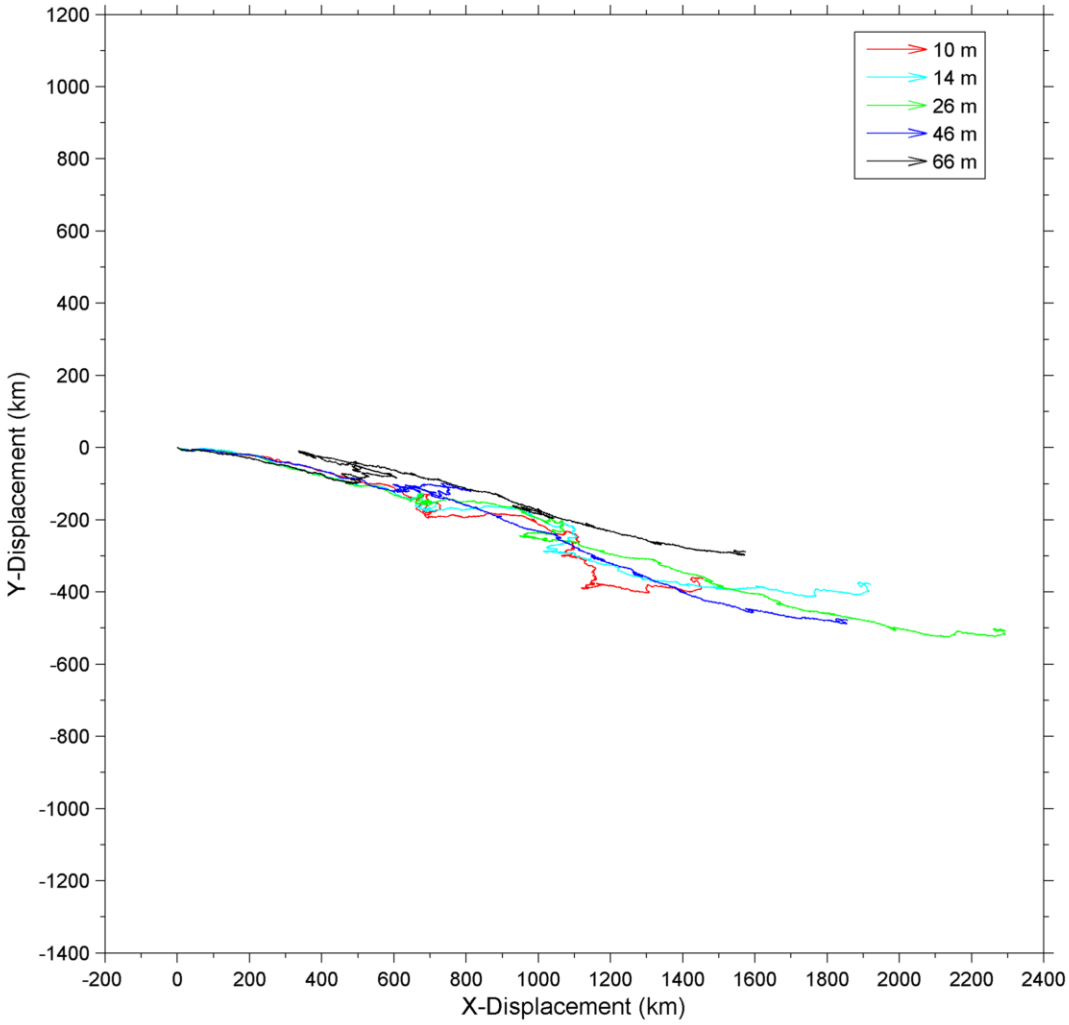


Figure 12: Progressive Vector Diagram, South-Central Barrow Strait. (Long Ranger ADCP) Aug. 2, 2007 – Aug. 2, 2008

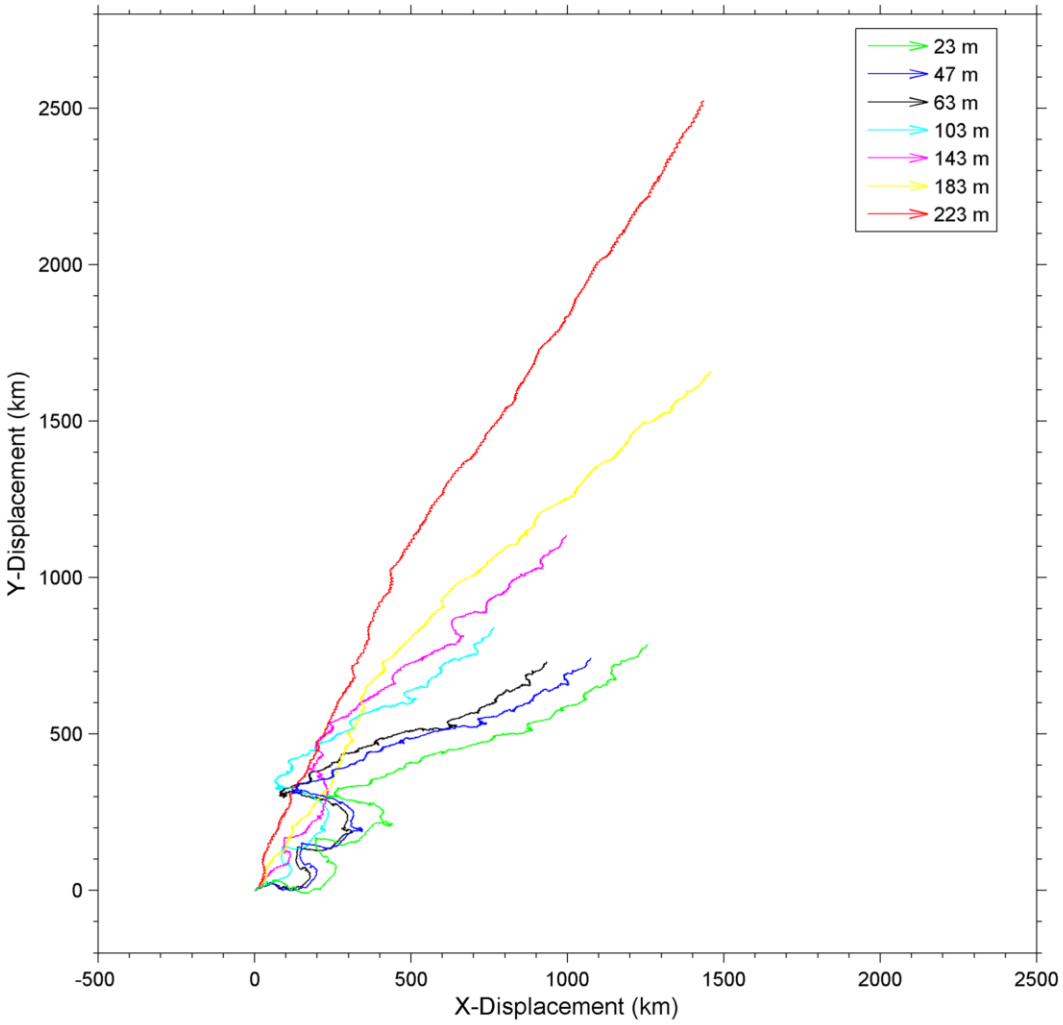


Figure 13: Progressive Vector Diagram, South-Central Barrow Strait. (Workhorse ADCP) Aug. 2, 2007 – Aug. 2, 2008

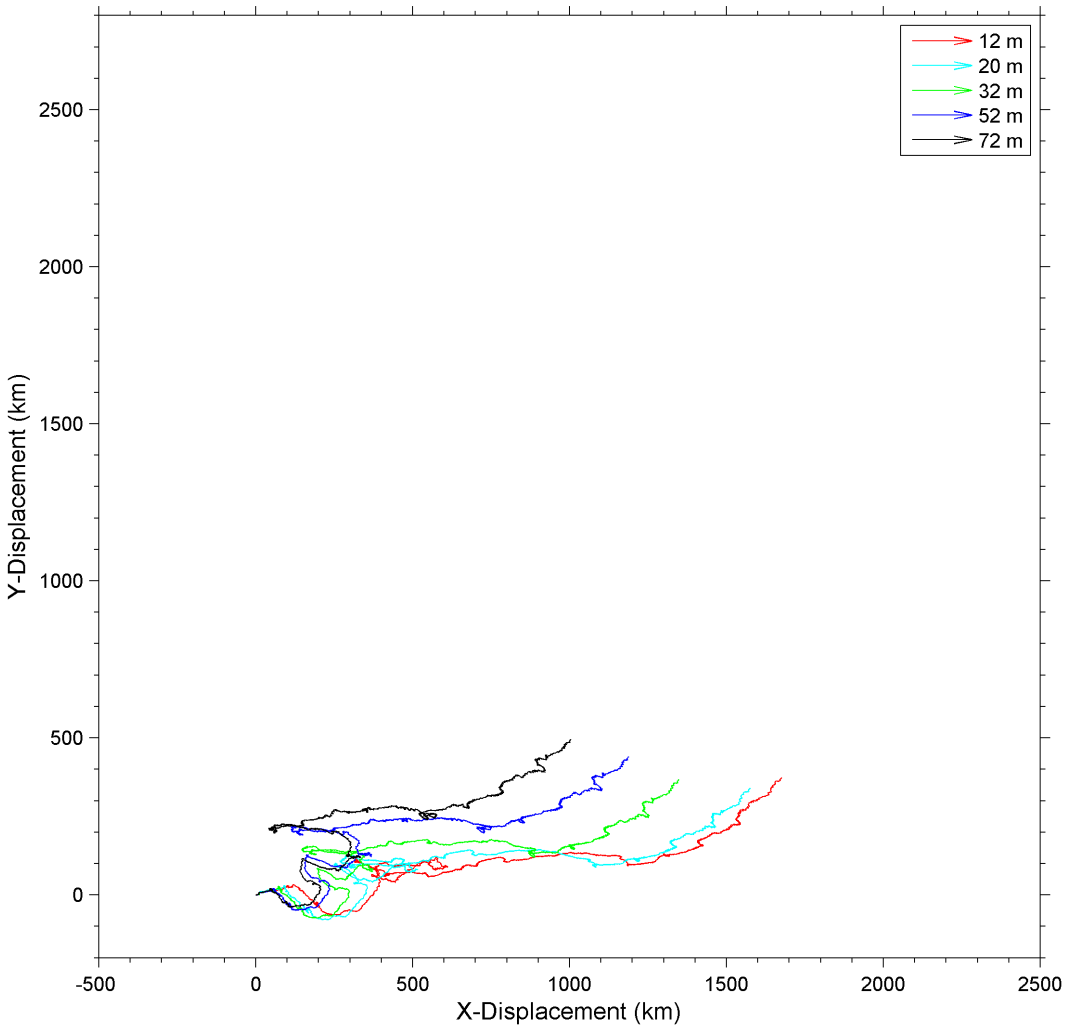


Figure 14: Bi-hourly current data, South Side Barrow Strait.
Sep. 1, 2007 – Sep. 30, 2007

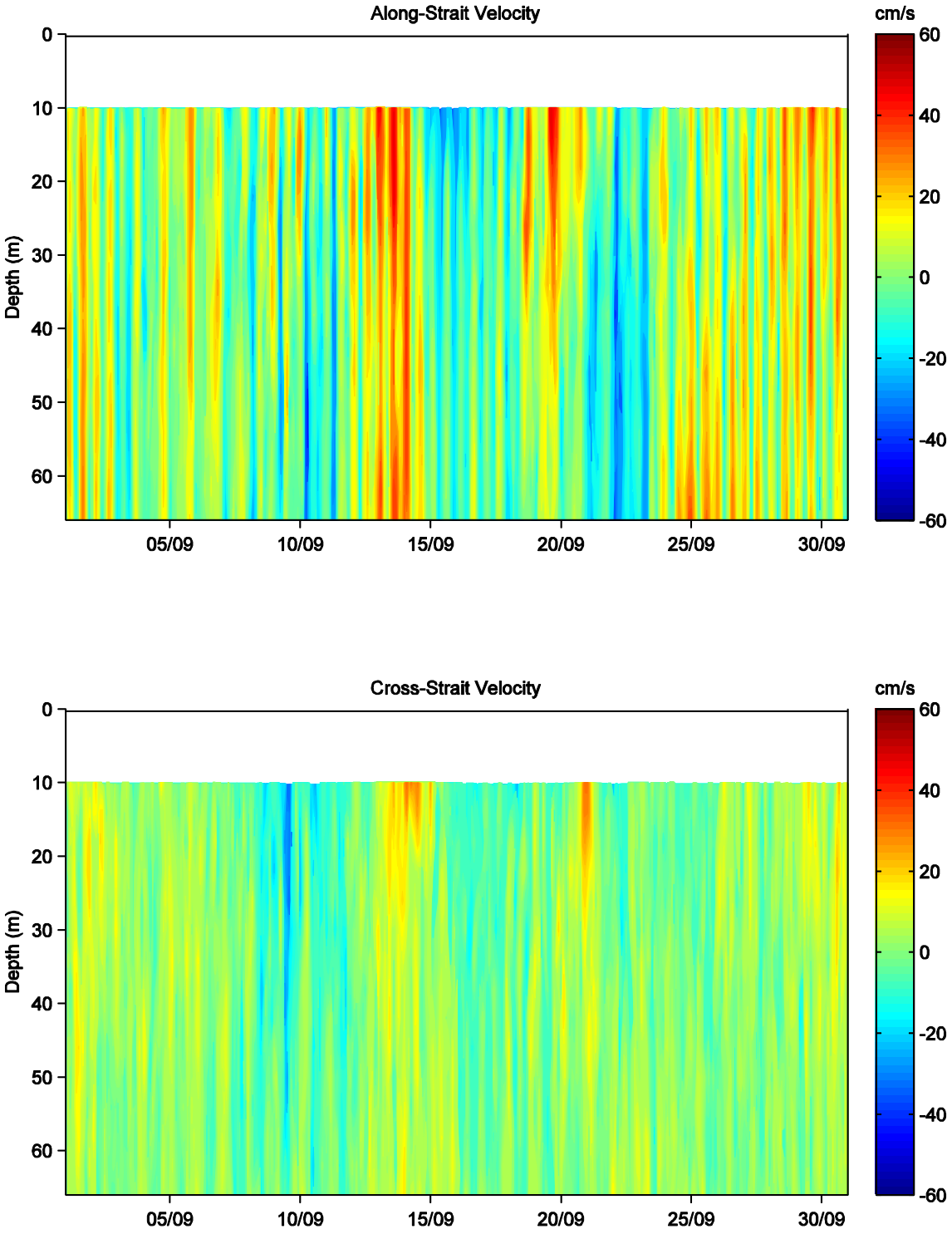


Figure 15: Bi-hourly current data, South-Central Barrow Strait. (Long Ranger ADCP), Sep. 1, 2007 – Sep. 30, 2007

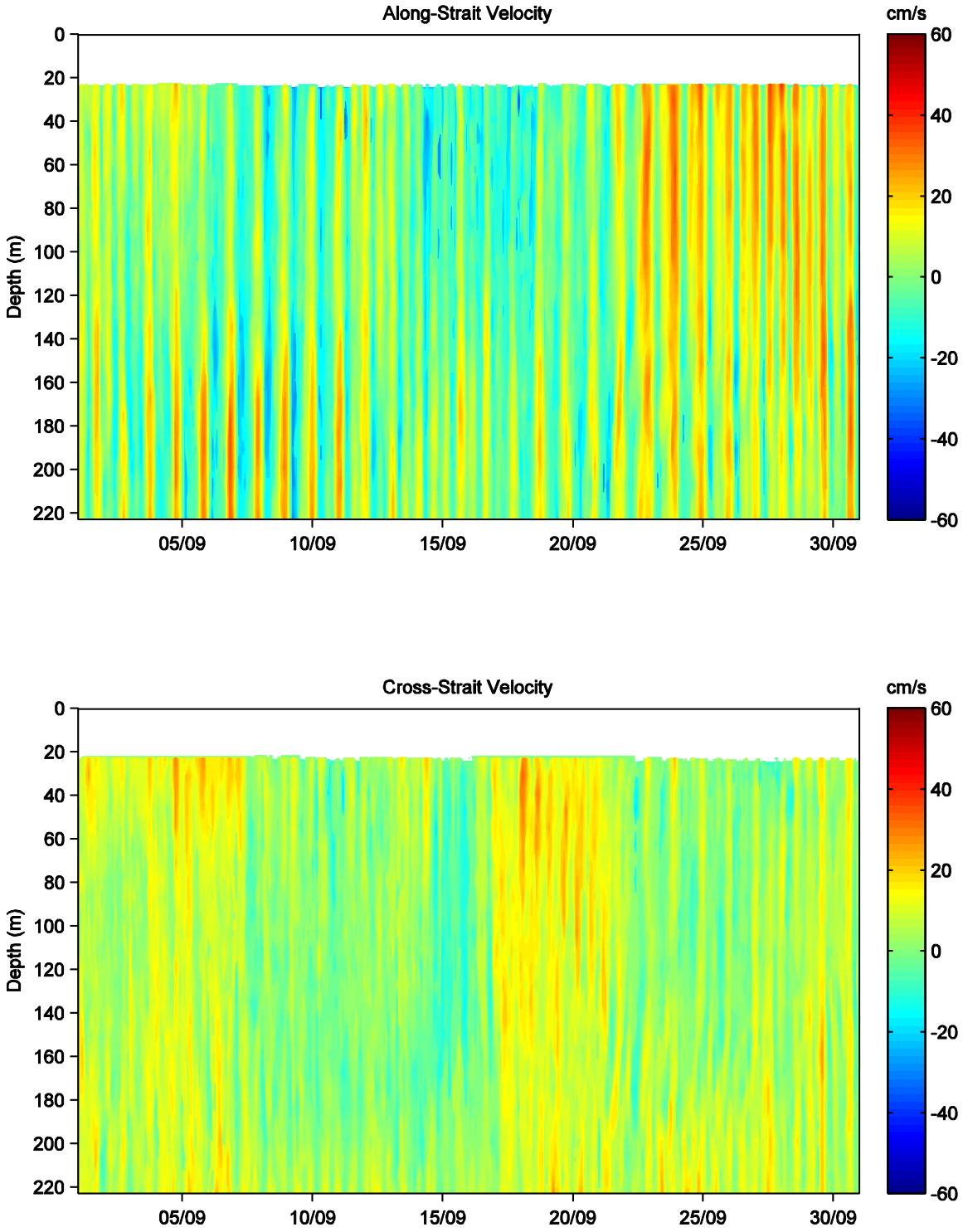


Figure 16: **Bi-hourly current data, South-Central Barrow Strait. (Workhorse ADCP) Sep. 1, 2007 – Sep. 30, 2007**

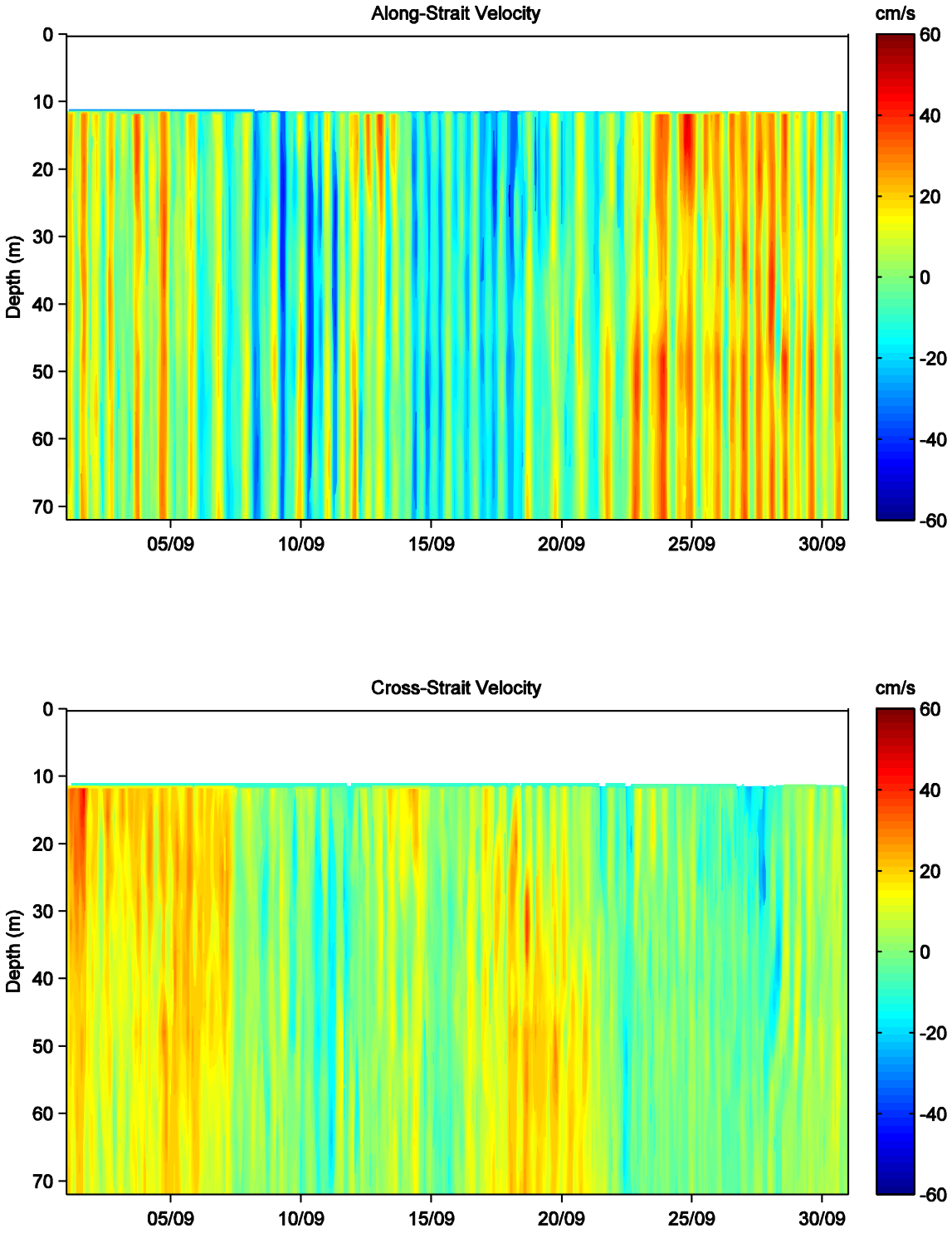


Figure 17: Low-pass filtered currents, South Side Barrow Strait. August 2007 – August 2008

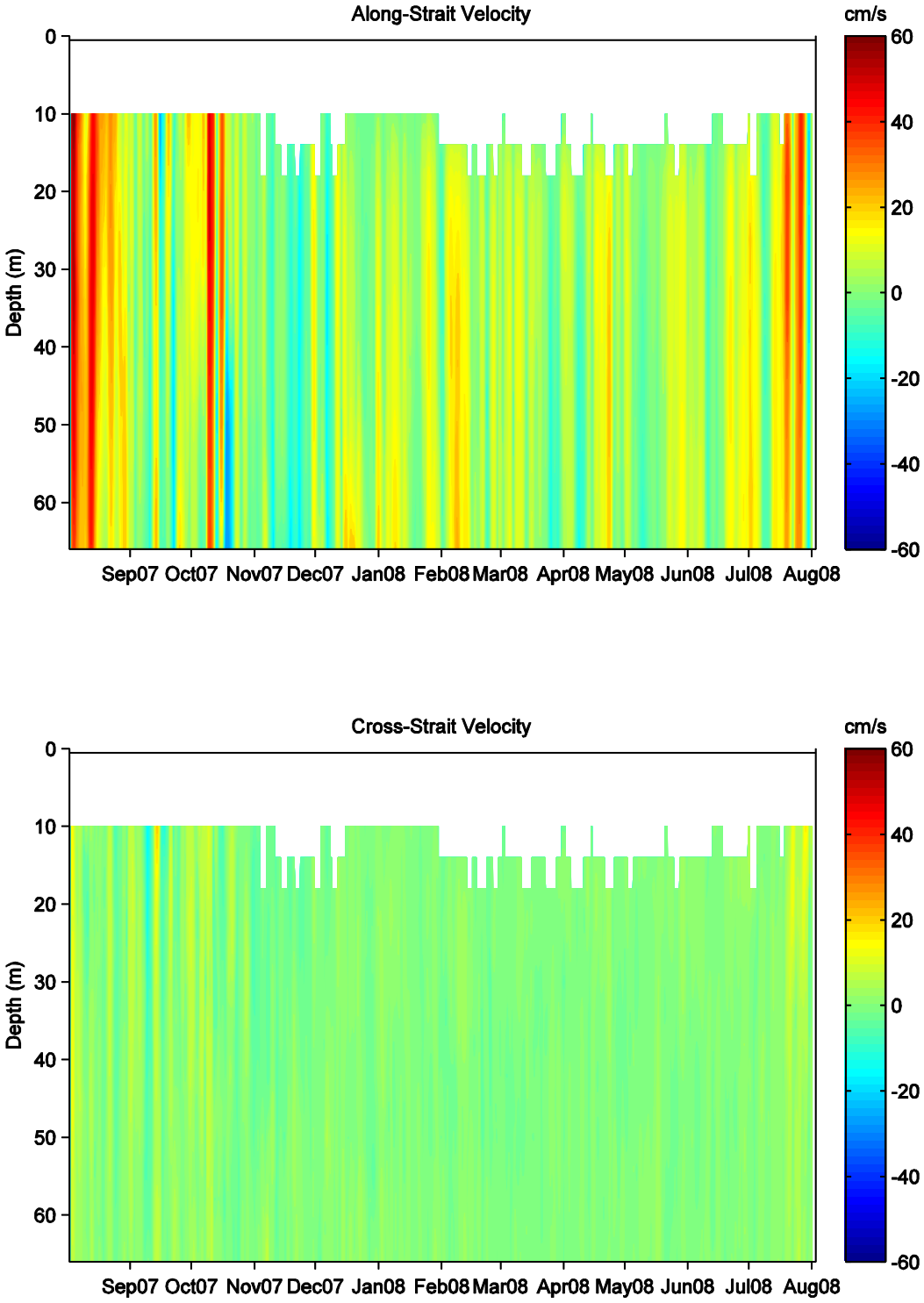


Figure 18: Low-pass filtered currents, South-Central Barrow Strait. (Long Ranger ADCP) August 2007 – August 2008

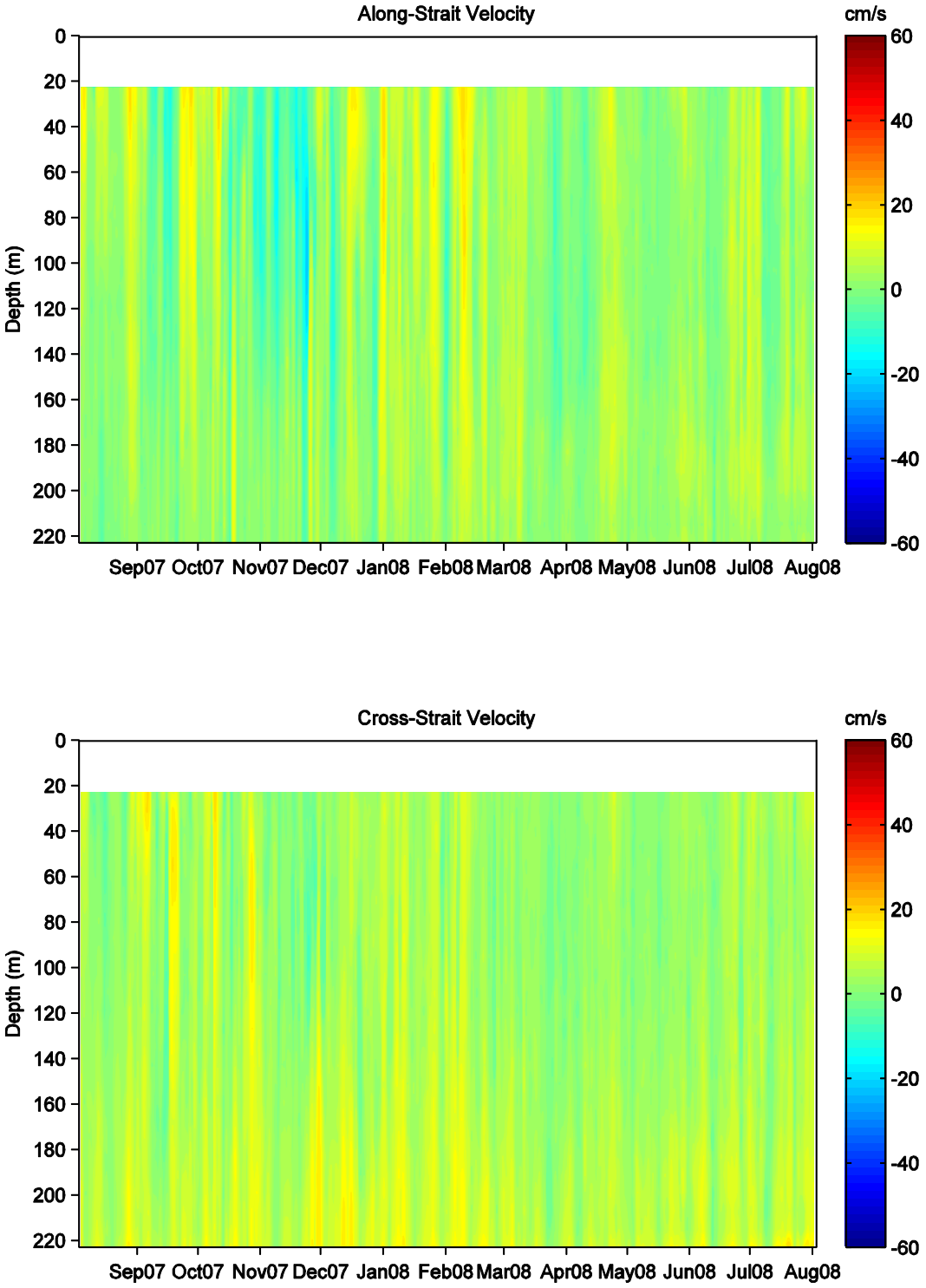


Figure 19: Low-pass filtered currents, South-Central Barrow Strait. (Workhorse ADCP) August 2007 - August 2008

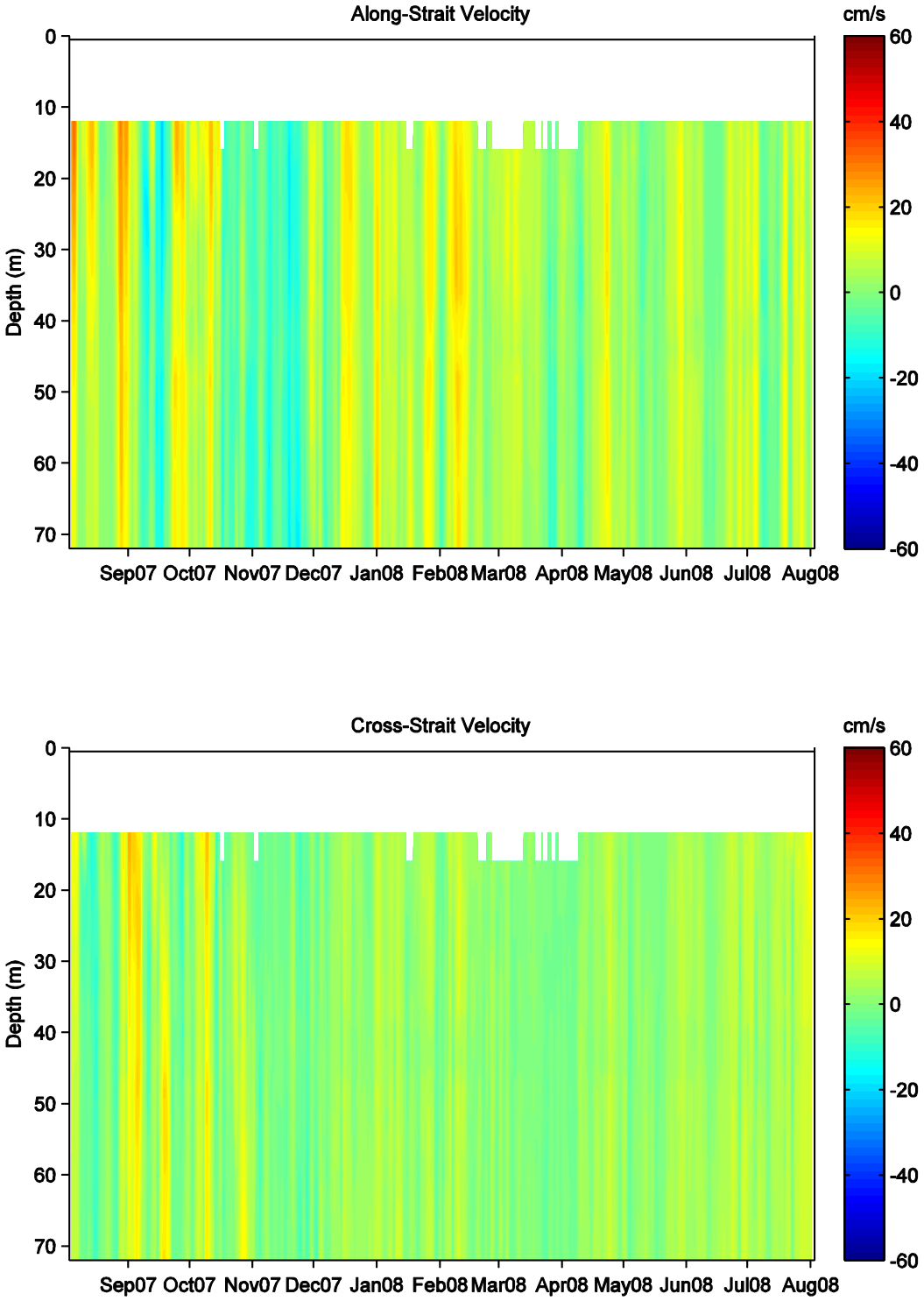
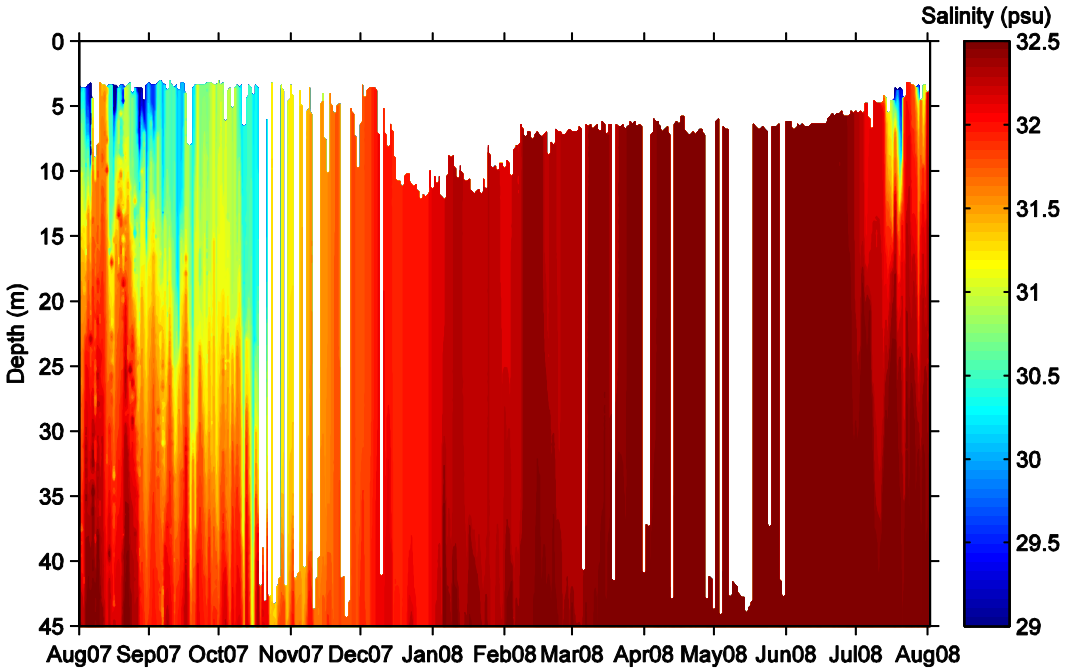


Figure 20: Daily Icycler Measurements
South Barrow Strait, August 2007 - August 2008



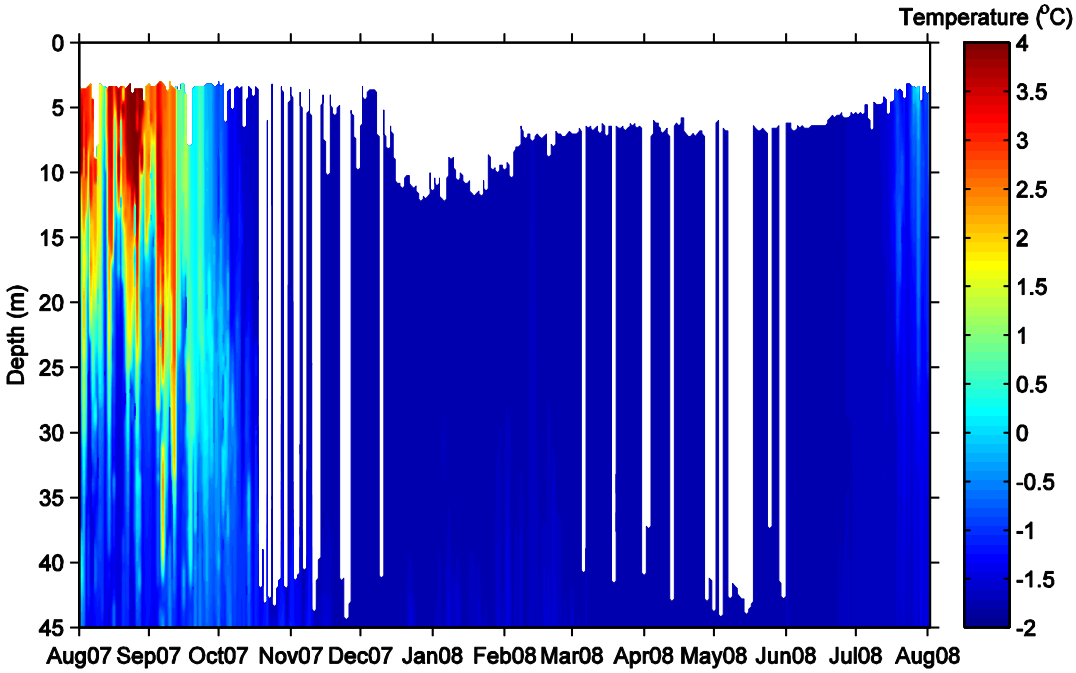
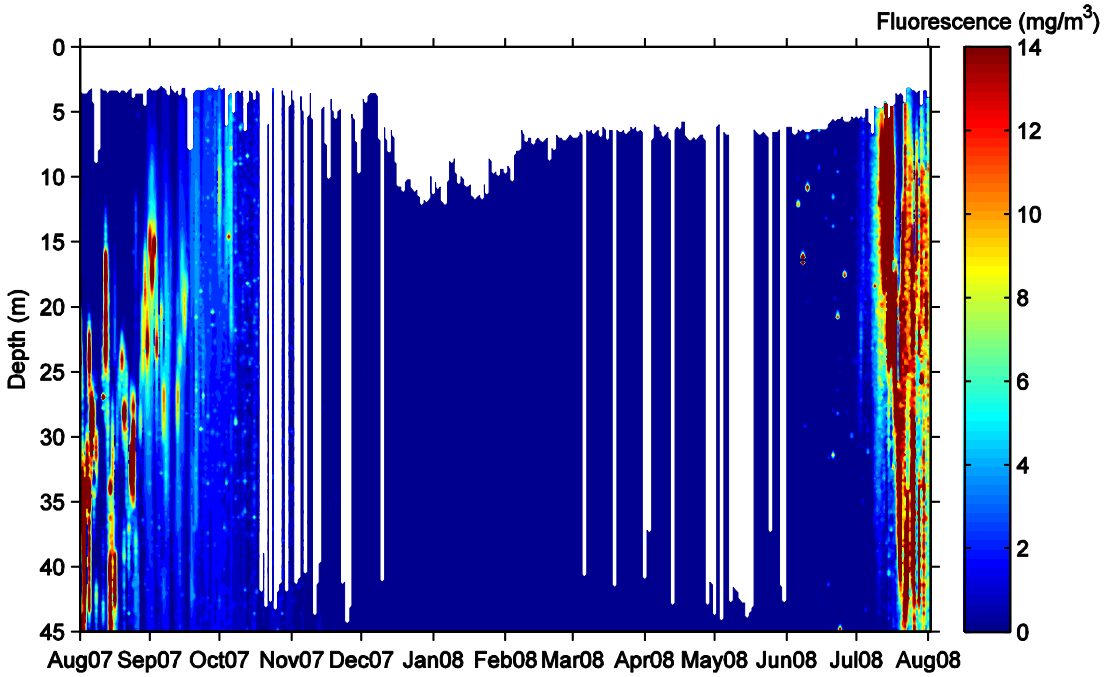


Figure 20 (continued): Daily Icycler Measurements
South Barrow Strait, August 2007 - August 2008



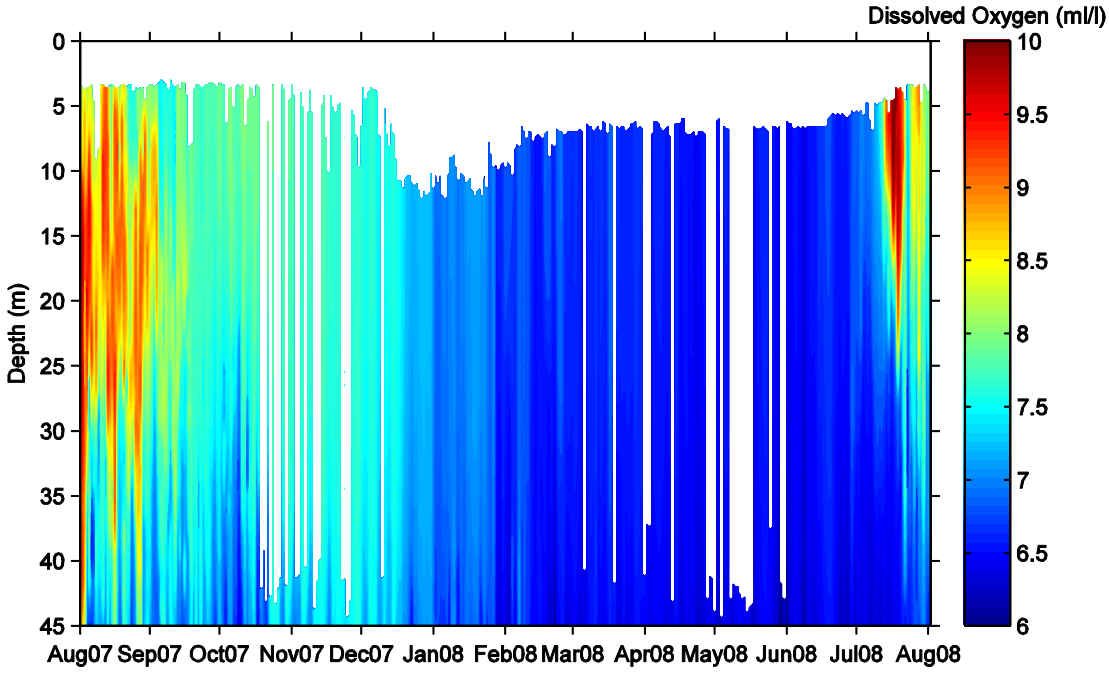


Figure 21: Low-pass filtered T,S (33 m.) and current data (34 m.). South Side Barrow Strait: August 2007 - August 2008.

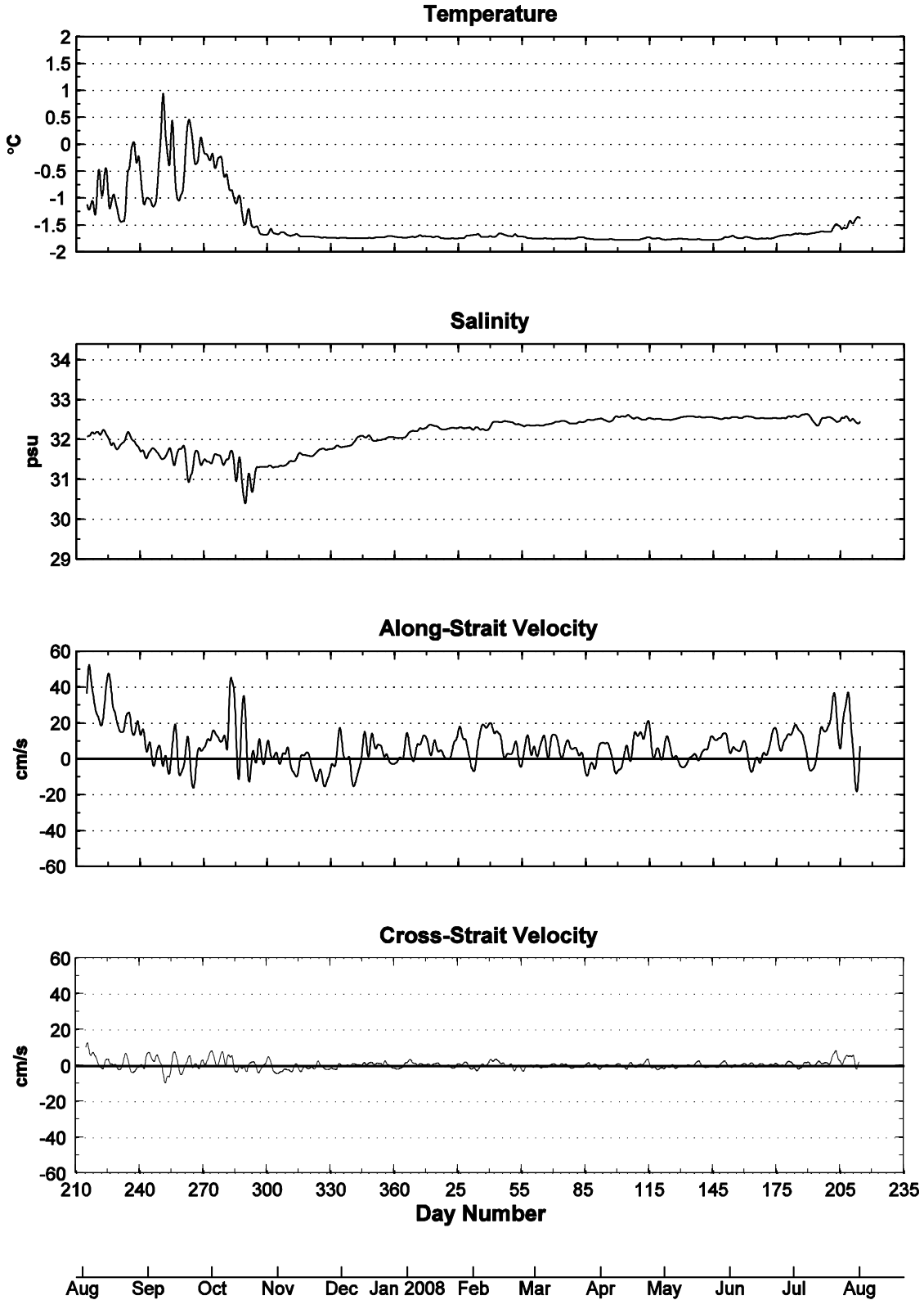


Figure 22: Low-pass filtered T,S (61 m.) and current data (62 m.). South Side Barrow Strait: August 2007 – August 2008.

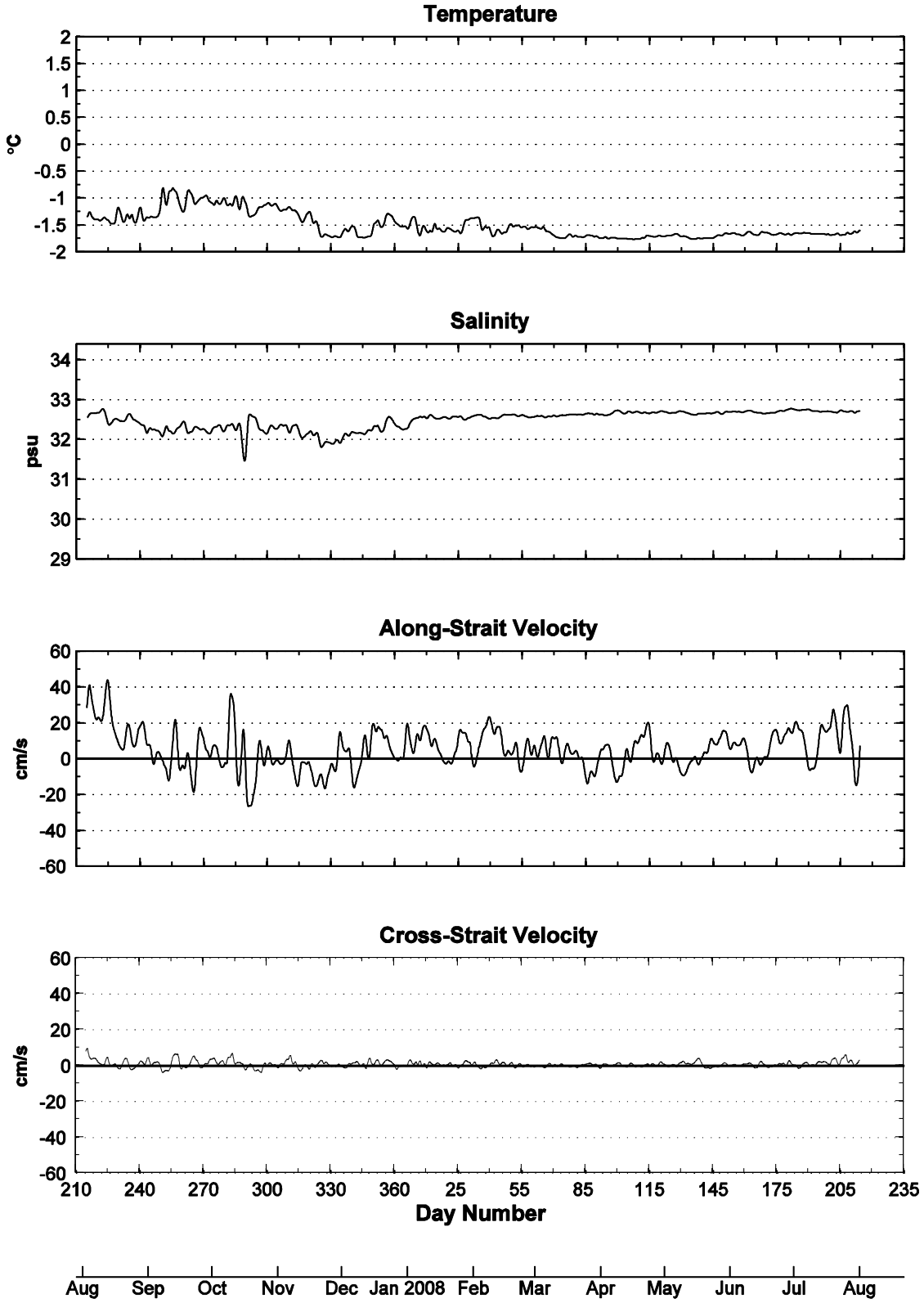


Figure 23: Low-pass filtered T,S (74 m.) and current data (66 m.). South Side Barrow Strait: August 2007 – August 2008.

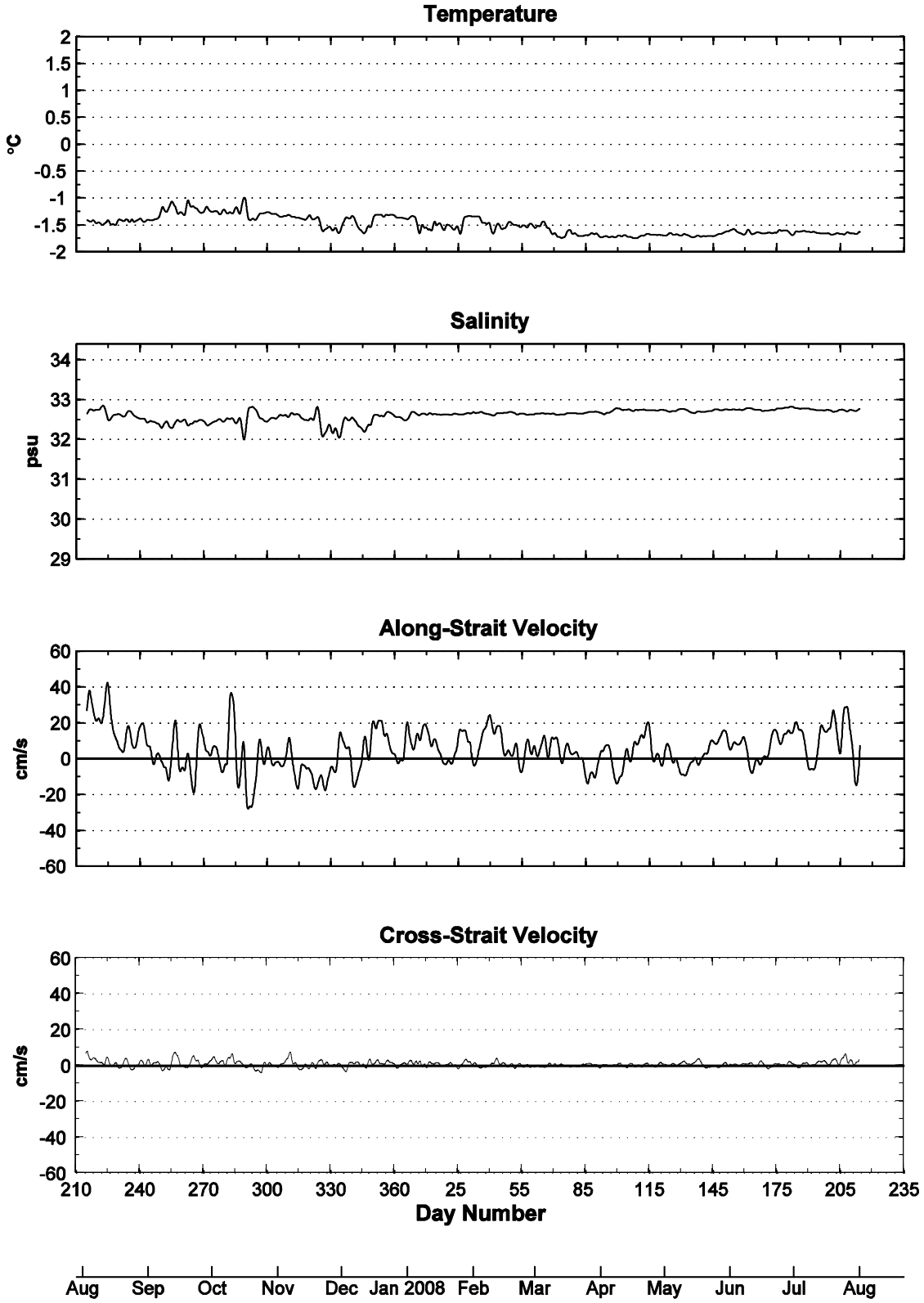


Figure 24: Low-pass filtered T,S data (143 m.)
South Side Barrow Strait: August 2007 – August 2008.

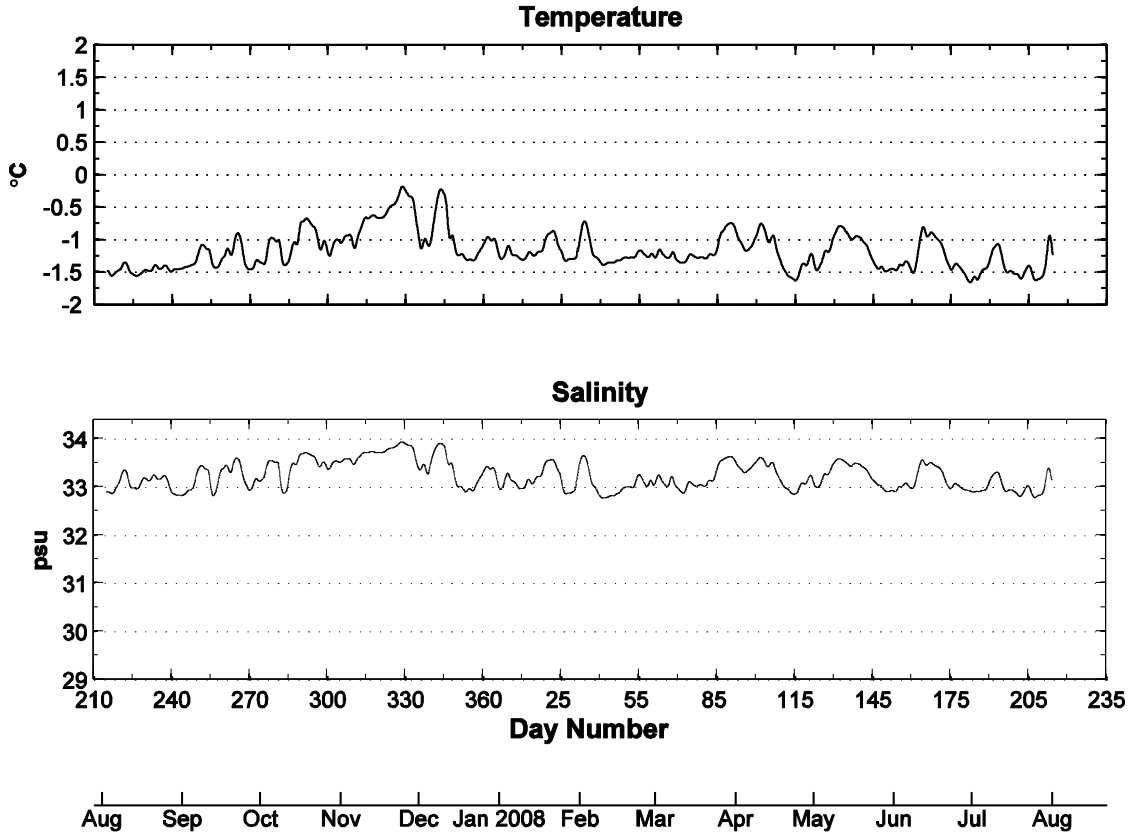


Figure 25: Low-pass filtered T,S (40 m.) and current data (36 m.). South-Central Barrow Strait: August 2007 - August 2008.

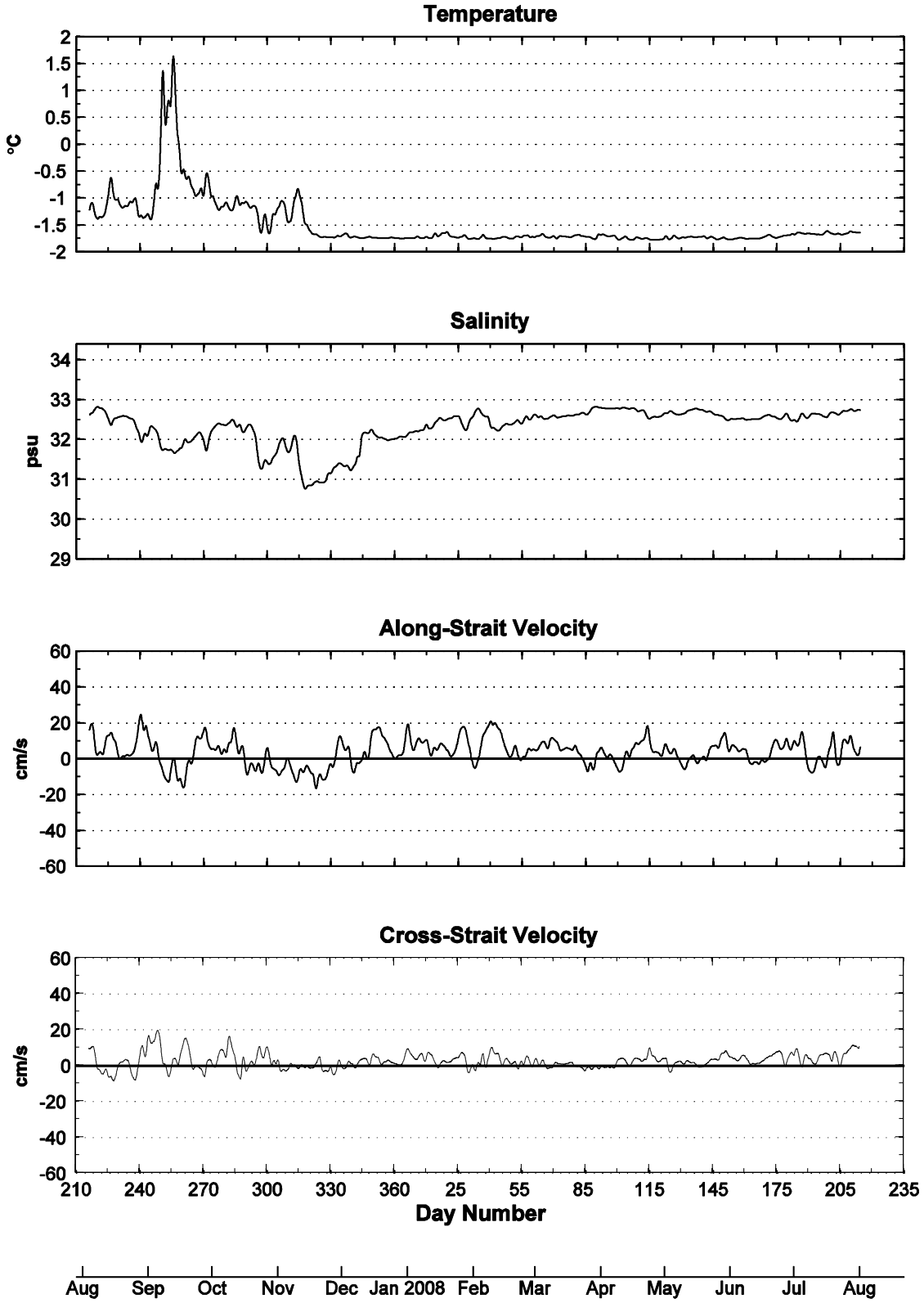


Figure 26: Low-pass filtered current data (79 m.). South-Central Barrow Strait: August 2007 - August 2008.

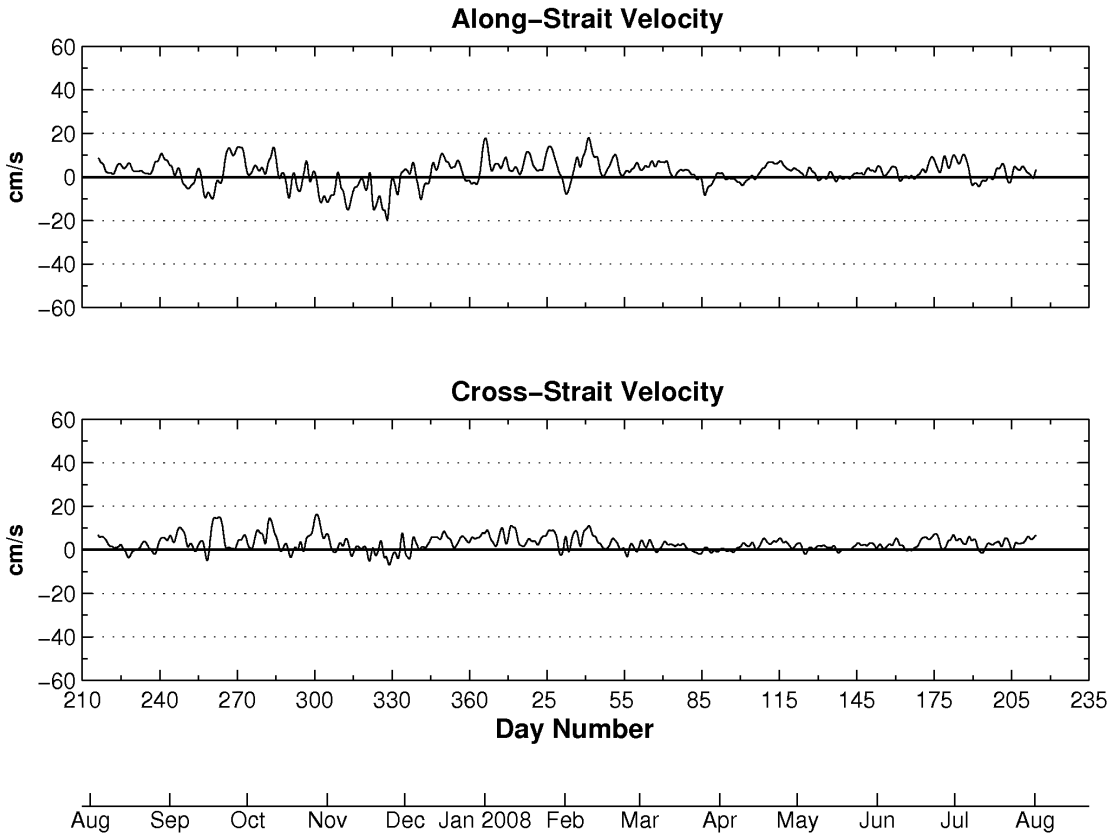


Figure 27: Low-pass filtered T,S (162 m.) and current data (159 m). South-Central Barrow Strait: August 2007 – August 2008.

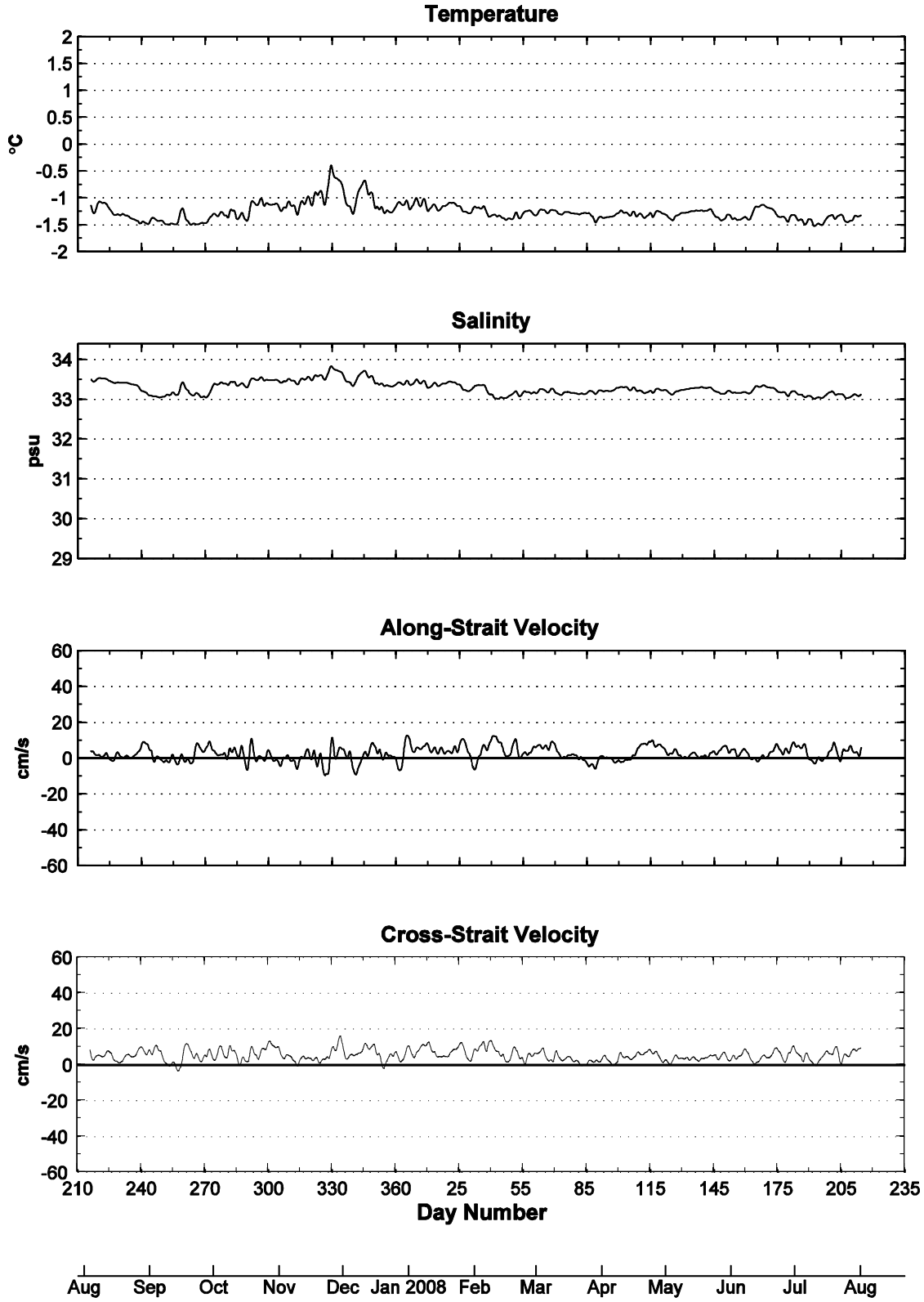


Figure 28: Low-pass filtered T,S (262 m.) and current data (223 m.). South-Central Barrow Strait: August 2007 – August 2008.

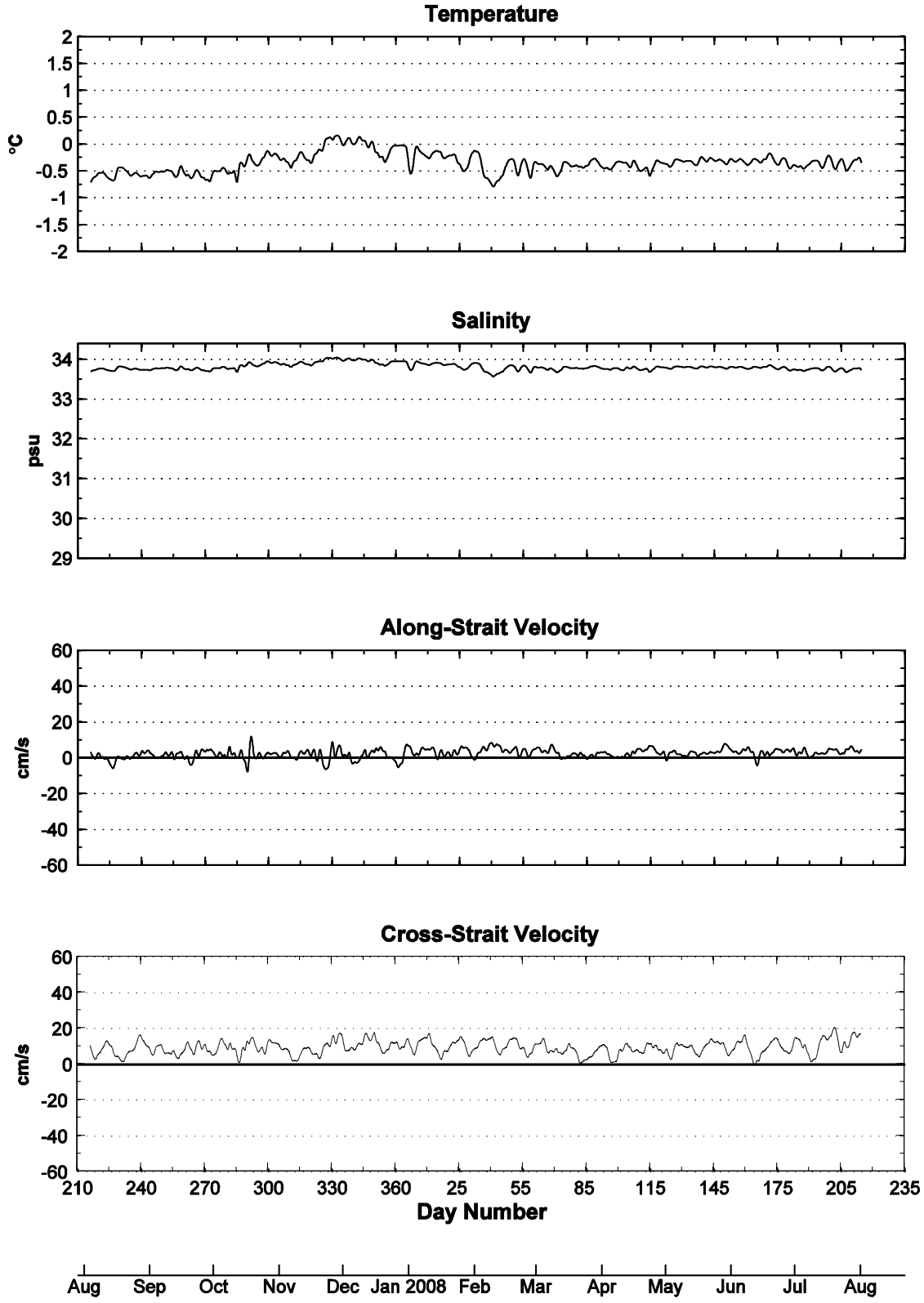


Figure 29: Low-pass filtered T,S data (42 m.)
ArcticNet Mooring: August 2007 – August 2008.

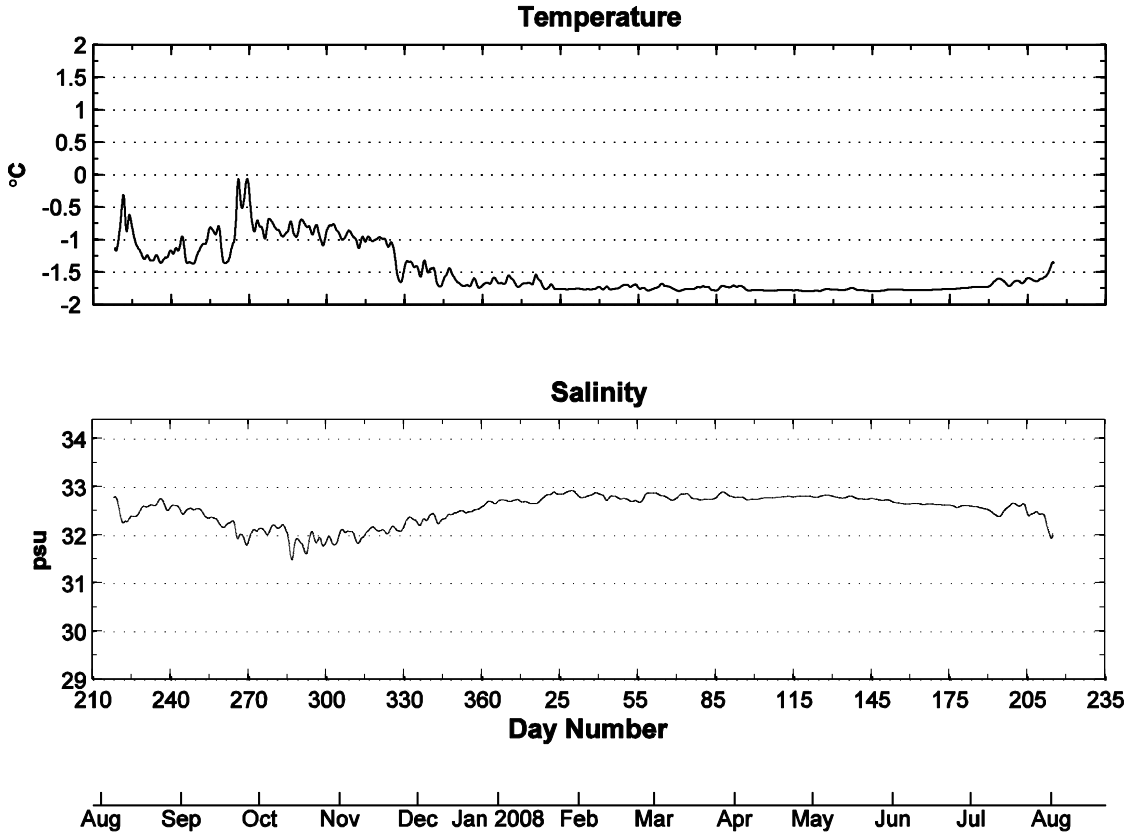


Figure 30: Mean Flows, Aug. 1, 2007 to Aug. 2, 2008.

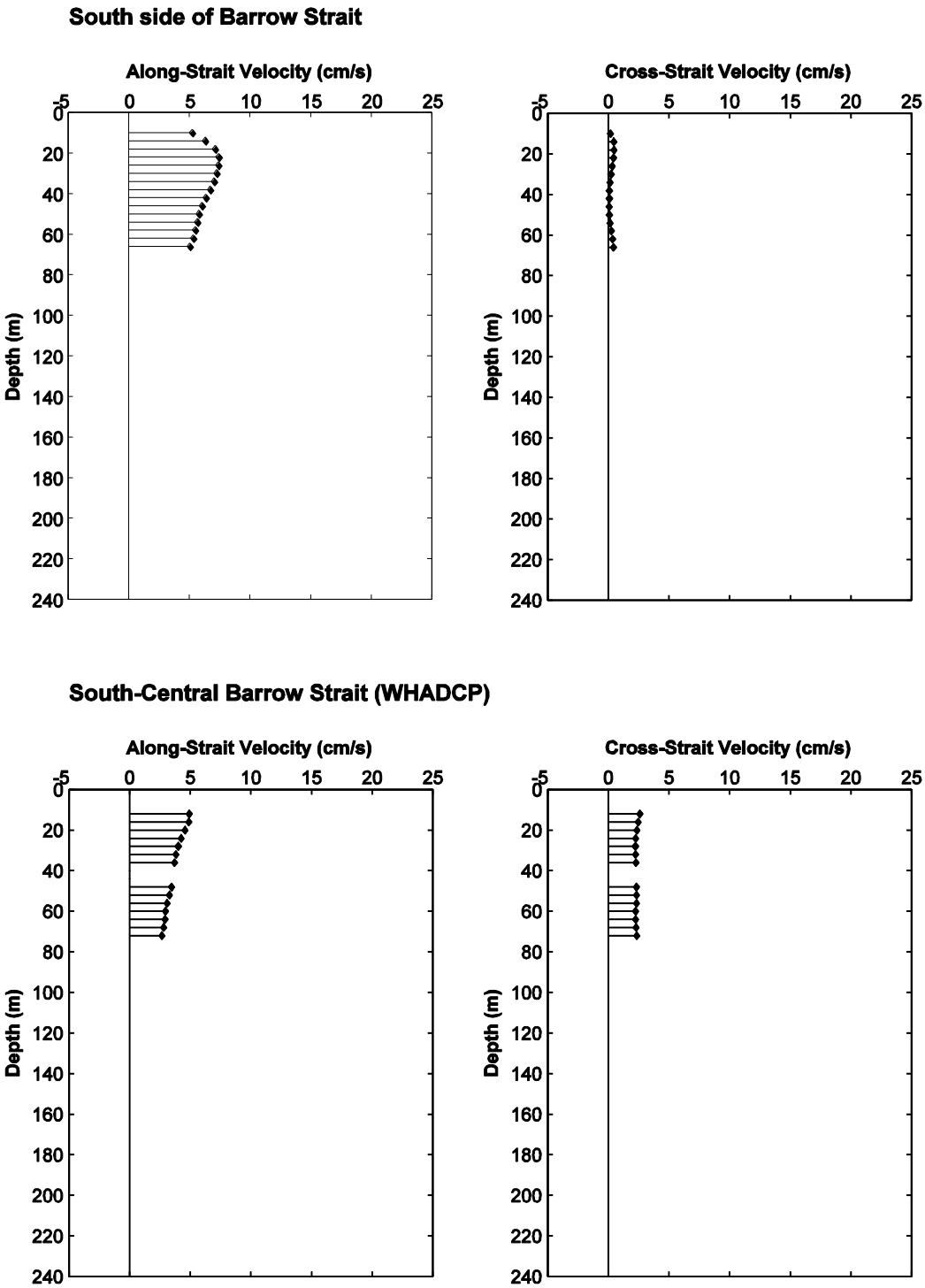


Figure 30: Mean Flows, Aug. 1, 2007 to Aug. 2, 2008. (continued)

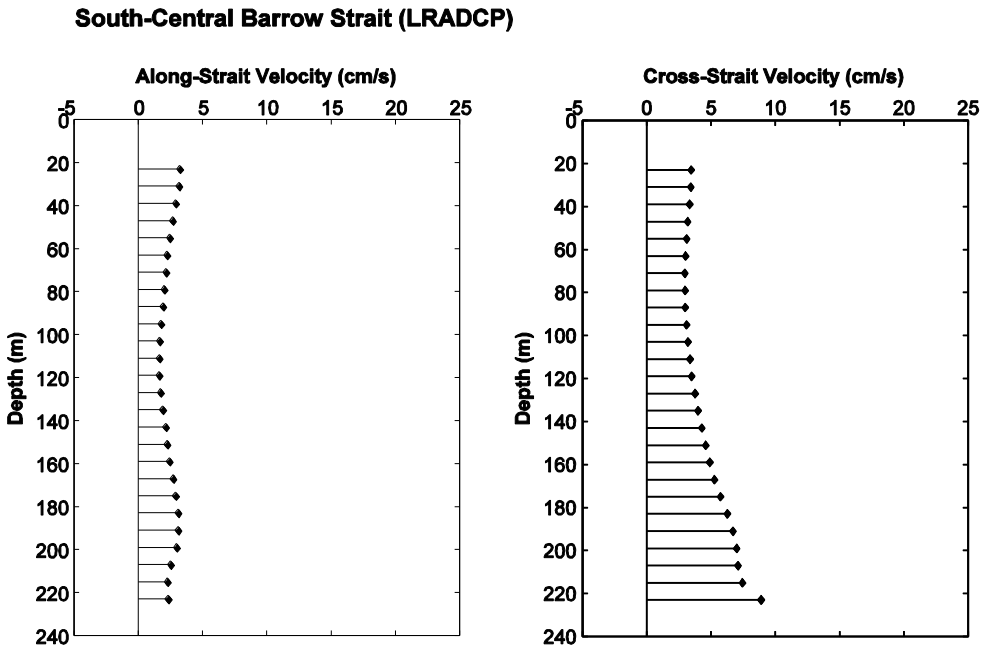


Figure 31: Mean Flows, Late Summer: Aug. 2007 to Sep. 2007.

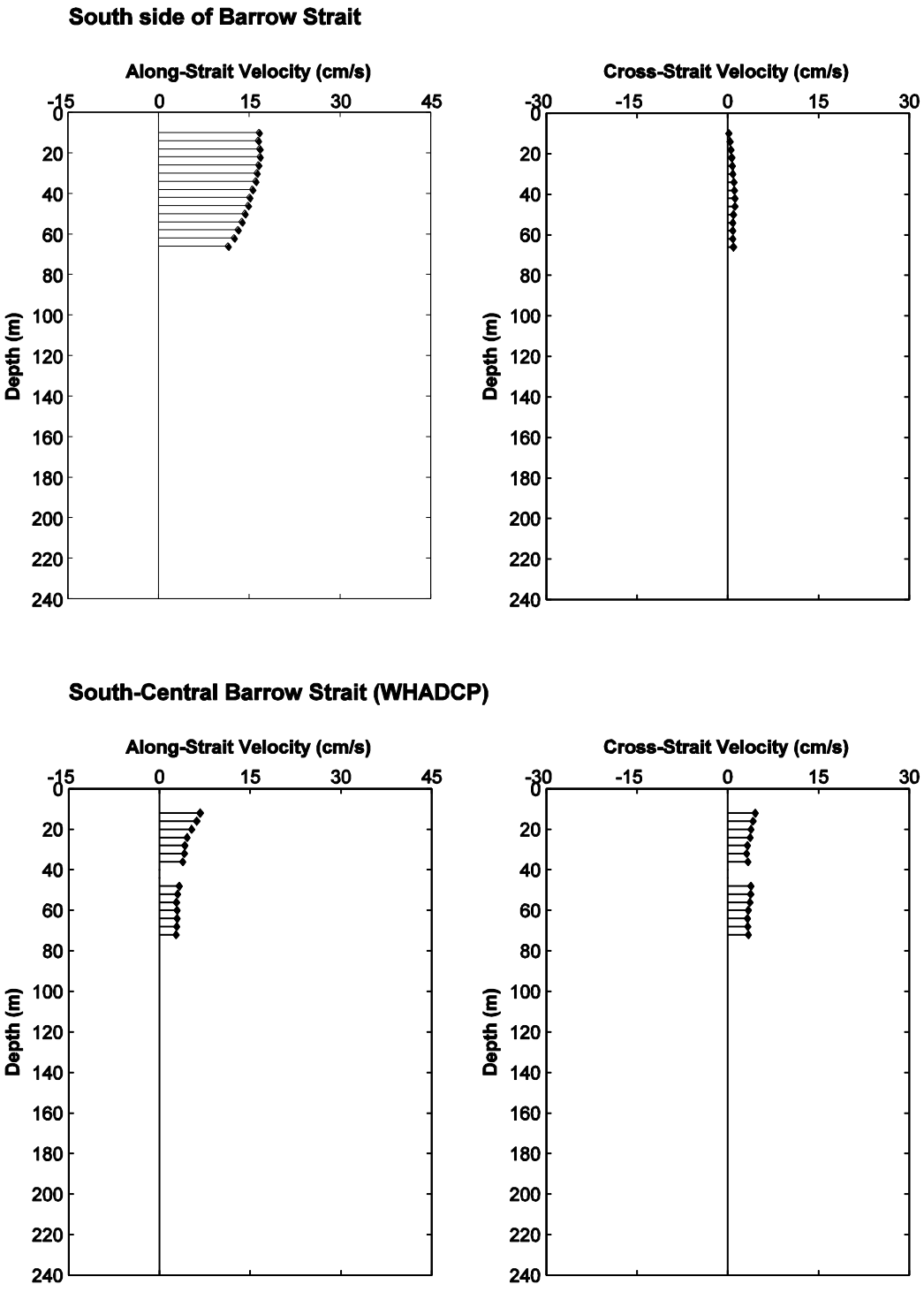


Figure 31: Mean Flows, Late Summer: Aug. 2007 to Sep. 2007 (continued)

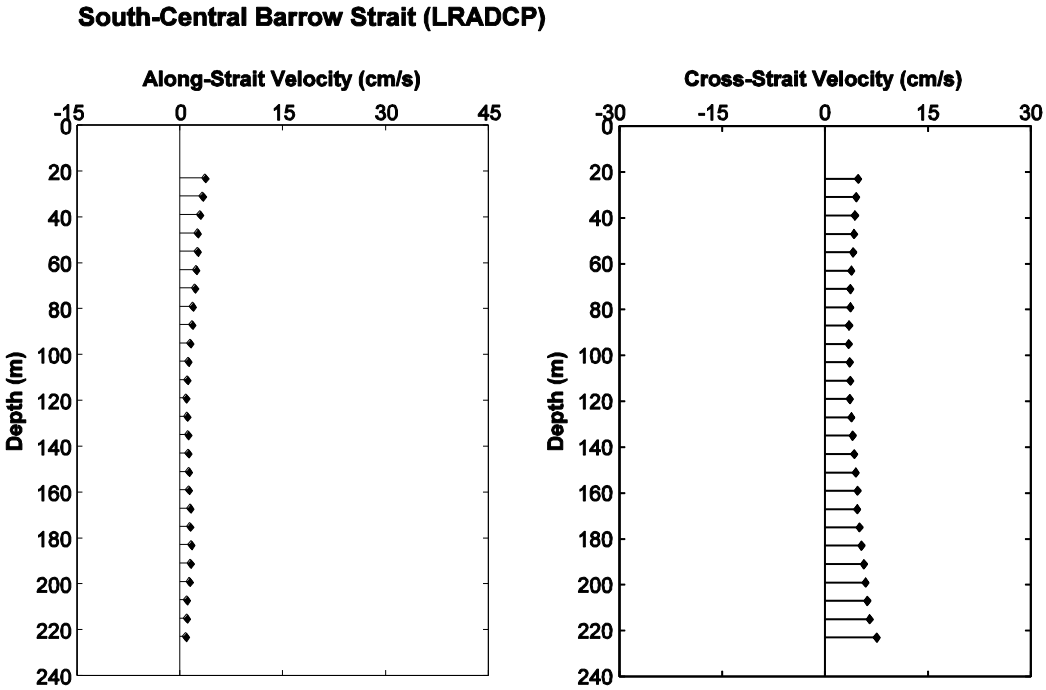


Figure 32: Mean Flows, Fall: Sep. 2007 to Dec. 2007.

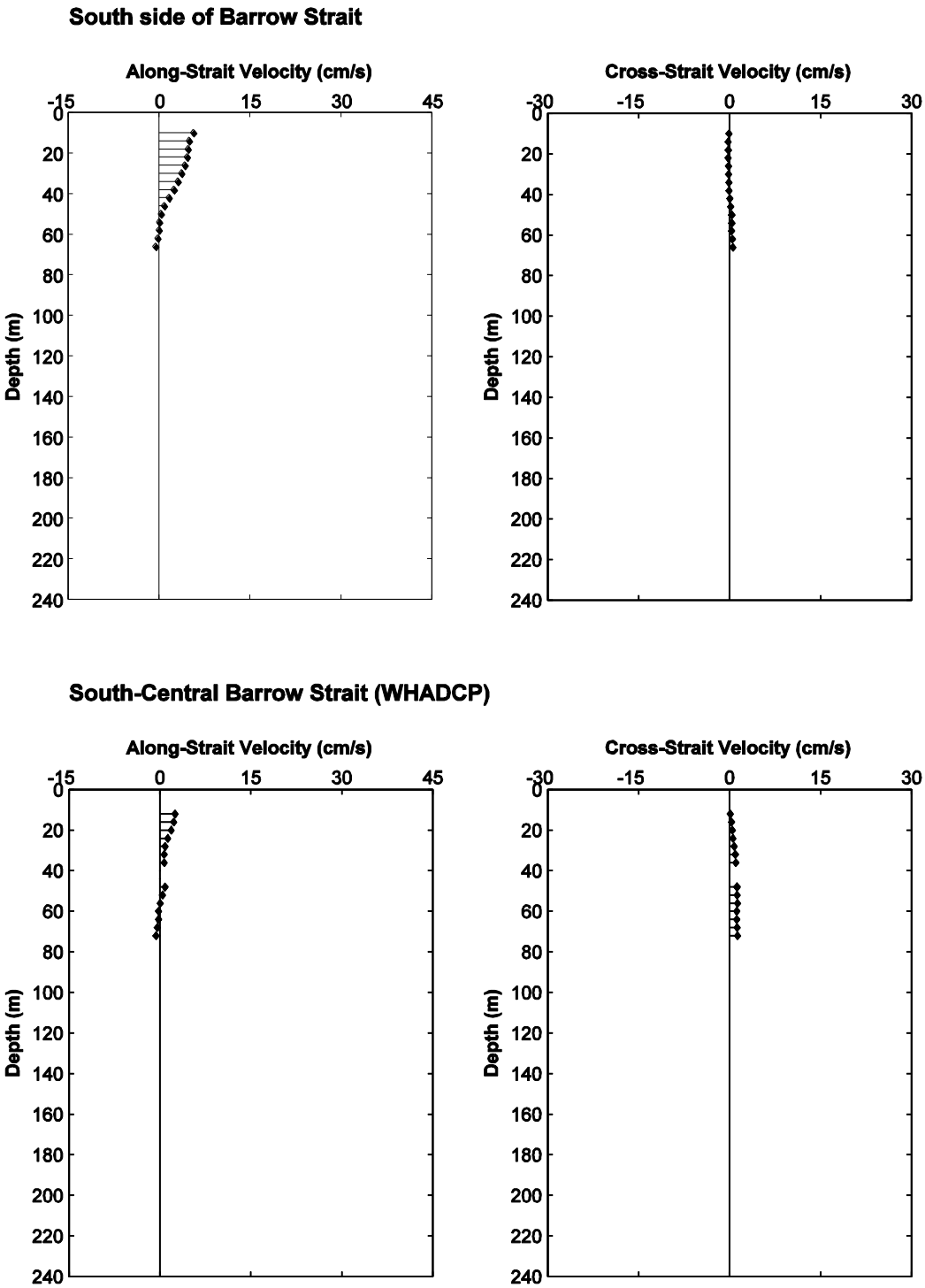


Figure 32: Mean Flows, Fall: Sep. 2007 to Dec. 2007 (continued).

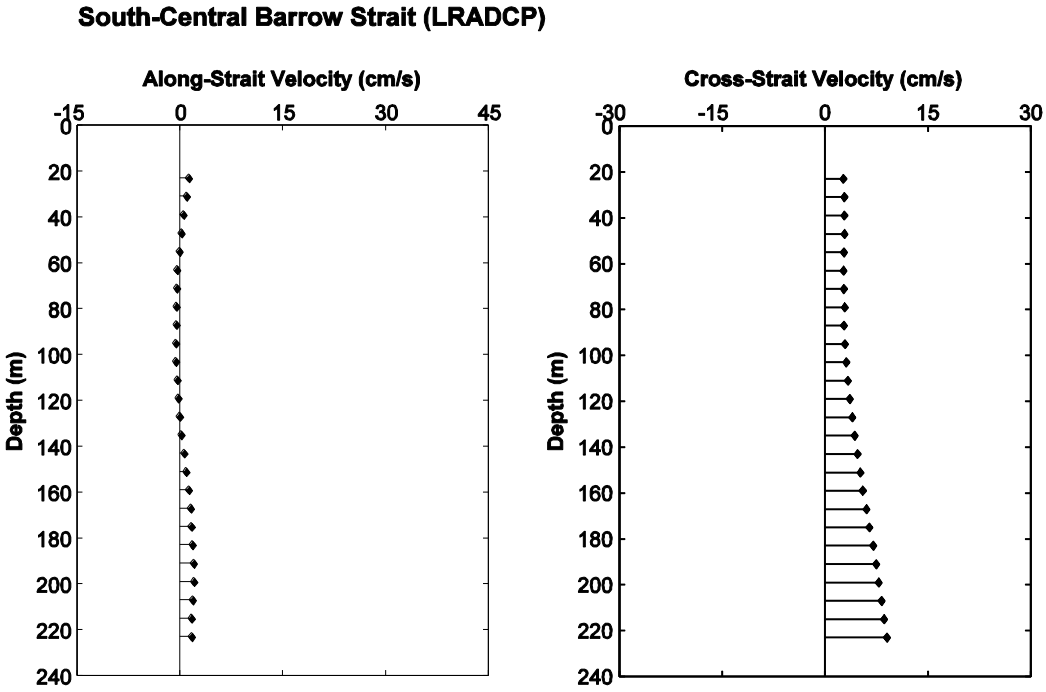
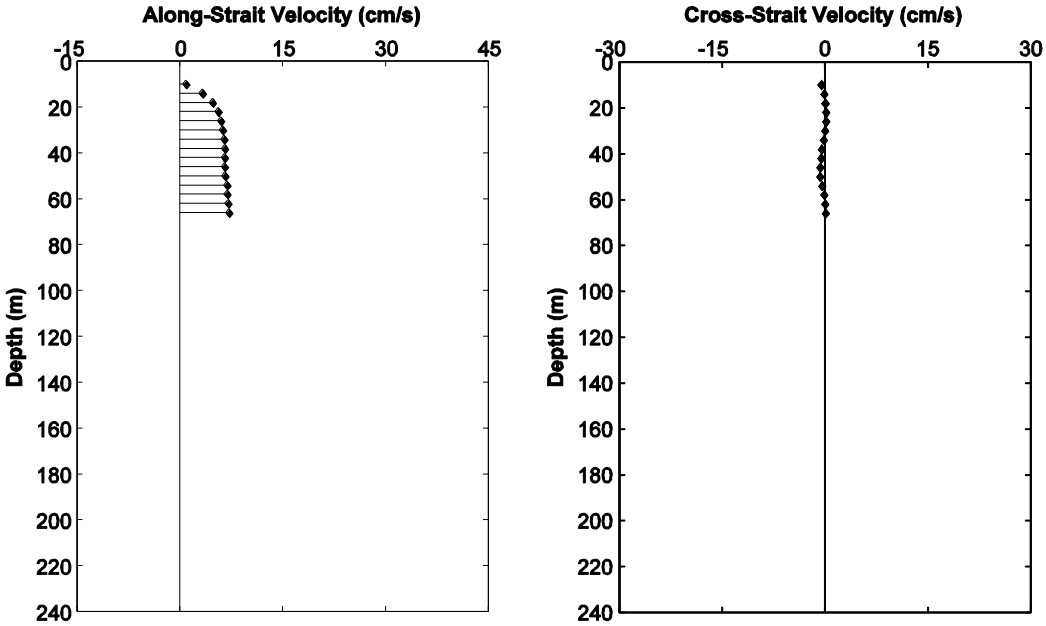


Figure 33: Mean Flows, Winter: Dec. 2007 to Mar. 2008.

South side of Barrow Strait



South-Central Barrow Strait (WHADCP)

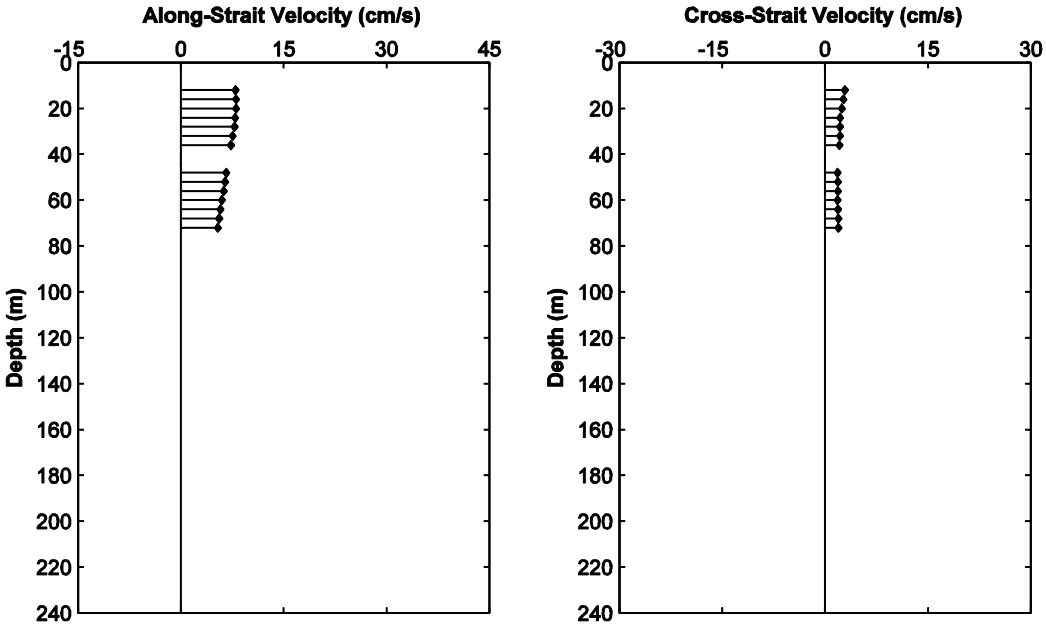


Figure 33: Mean Flows, Winter: Dec. 2007 to Mar. 2008 (continued).

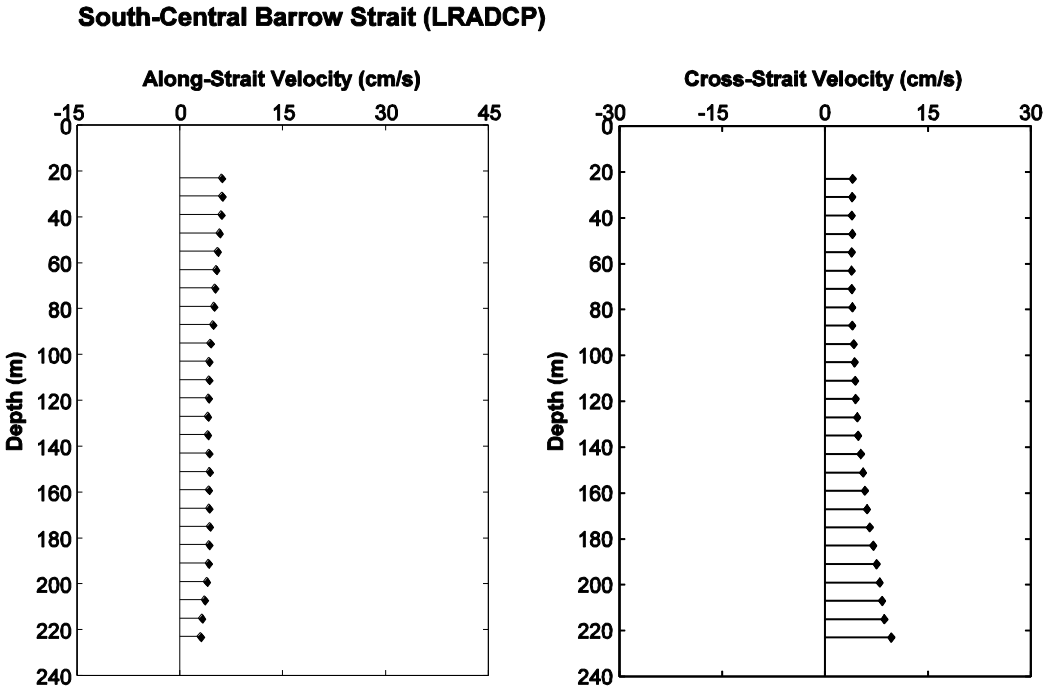
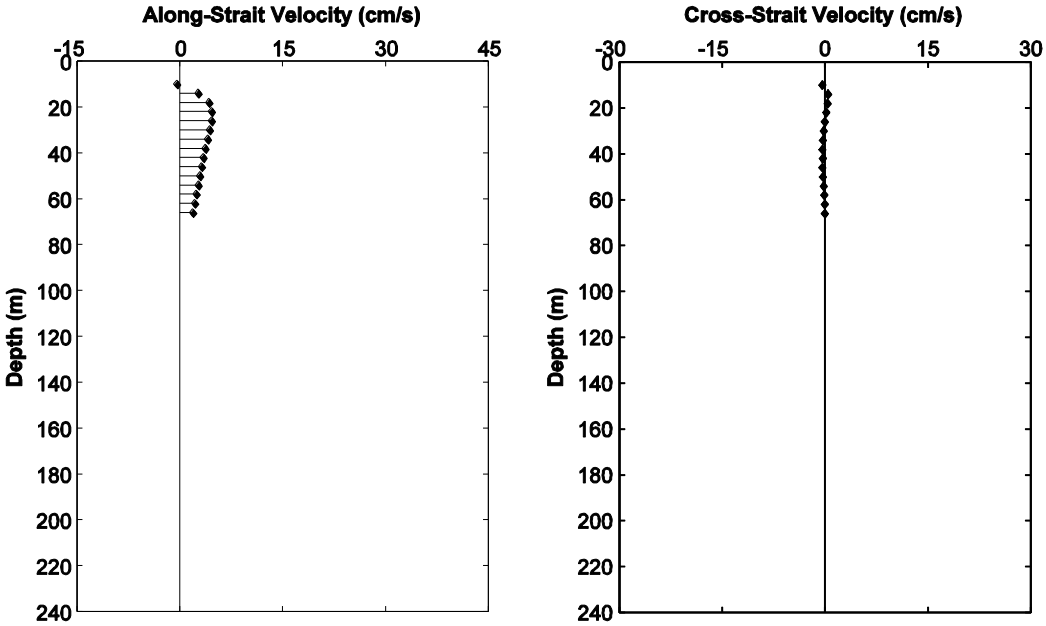


Figure 34: Mean Flows, Spring: Mar. 2008 to Jun. 2008.

South side of Barrow Strait



South-Central Barrow Strait (WHADCP)

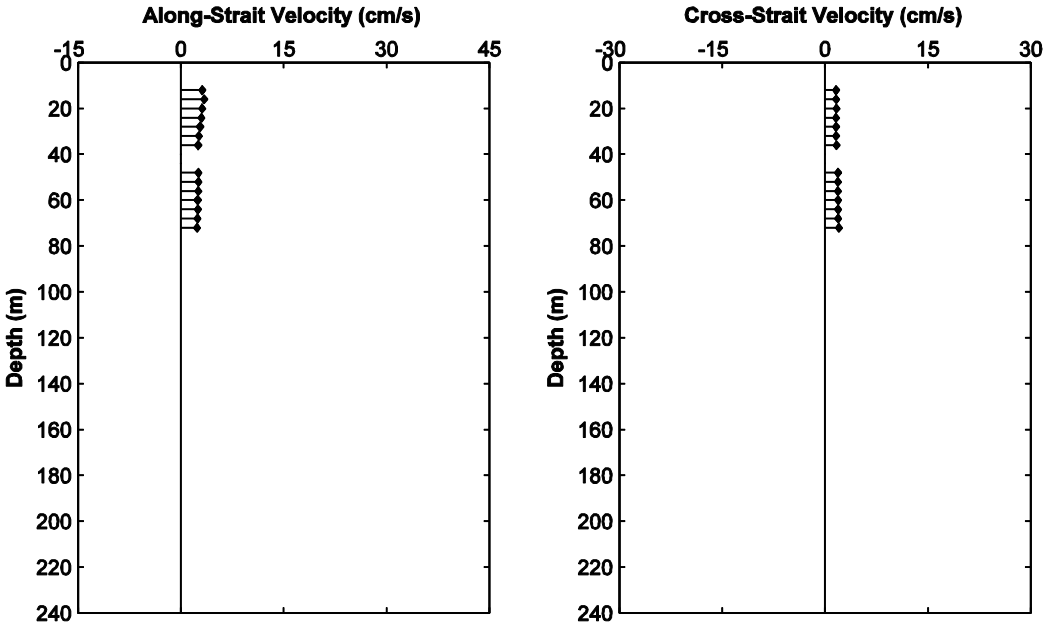


Figure 34: Mean Flows, Spring: Mar. 2008 to Jun. 2008 (continued).

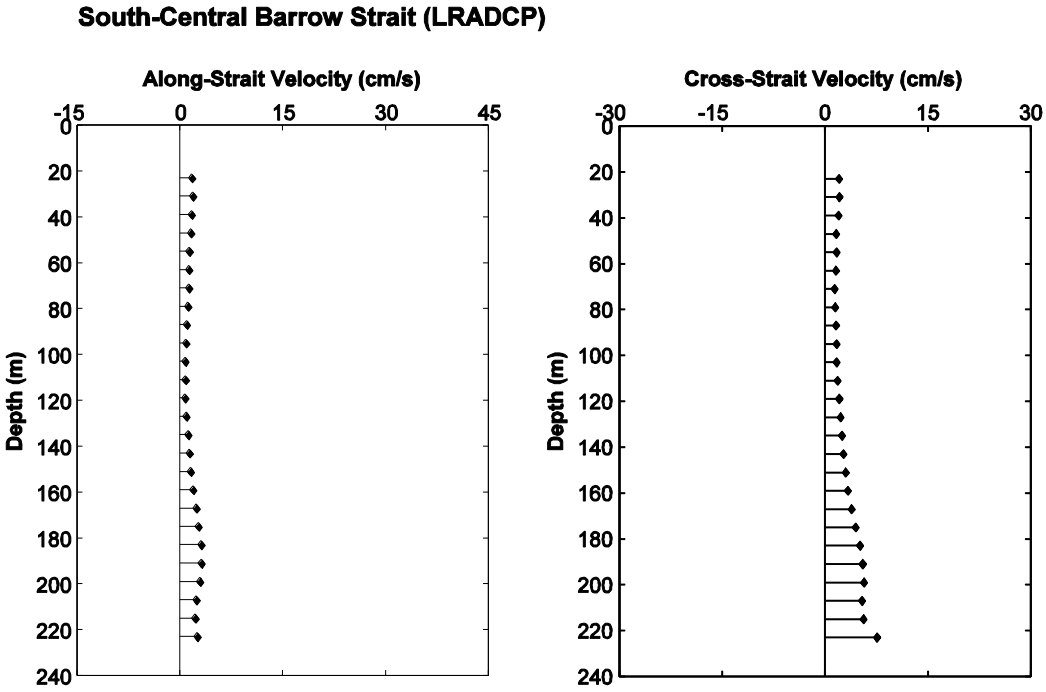
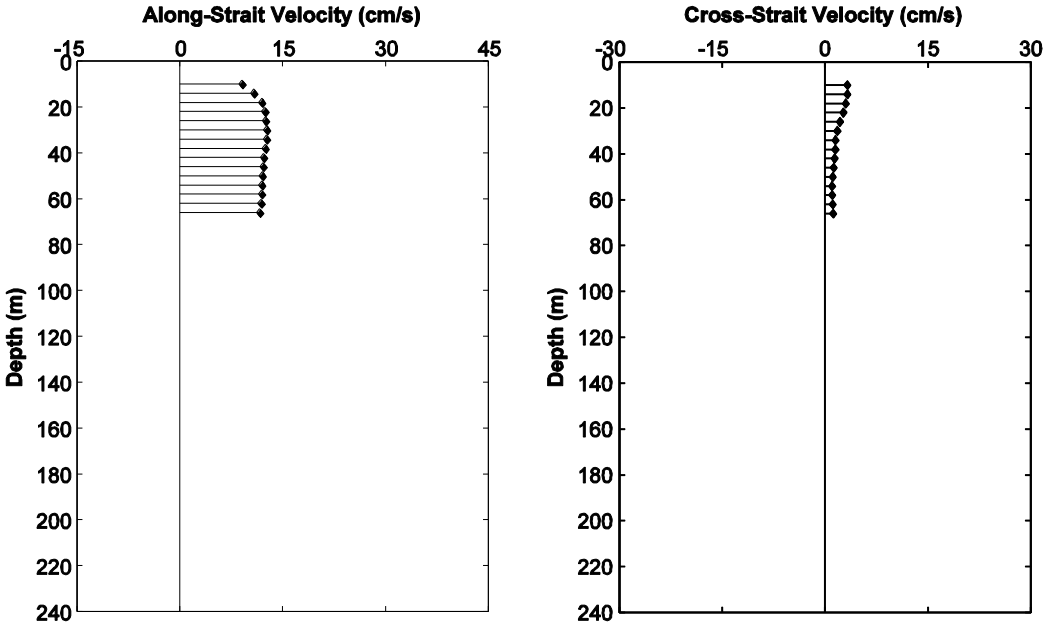


Figure 35: Mean Flows, Early Summer: Jun. 2008 to Aug. 2008.

South side of Barrow Strait



South-Central Barrow Strait (WHADCP)

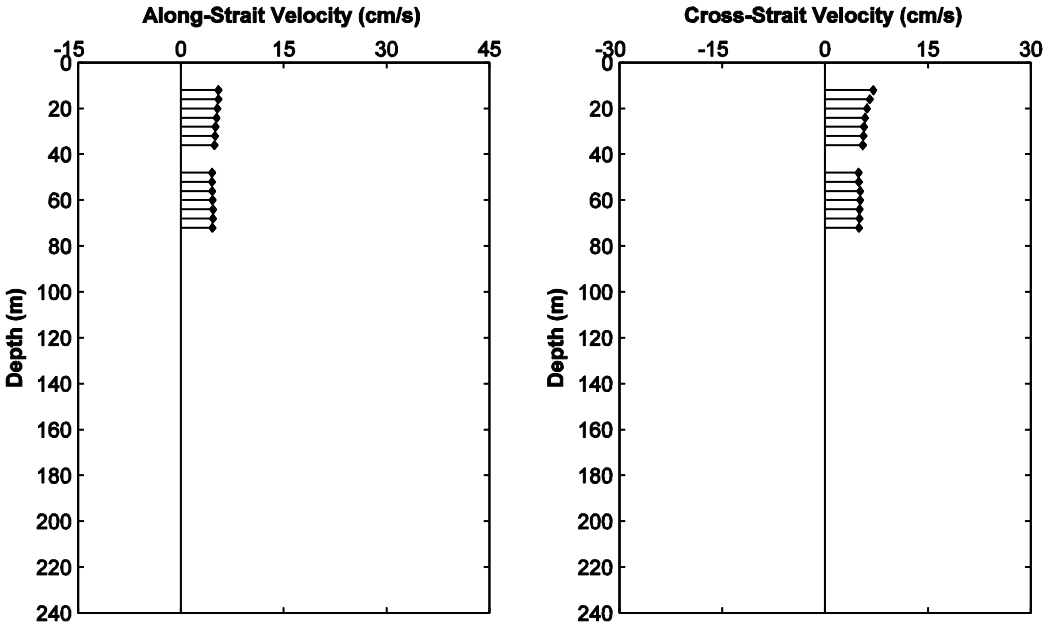


Figure 35: Mean Flows, Early Summer: Jun. 2008 to Aug. 2008 (continued).

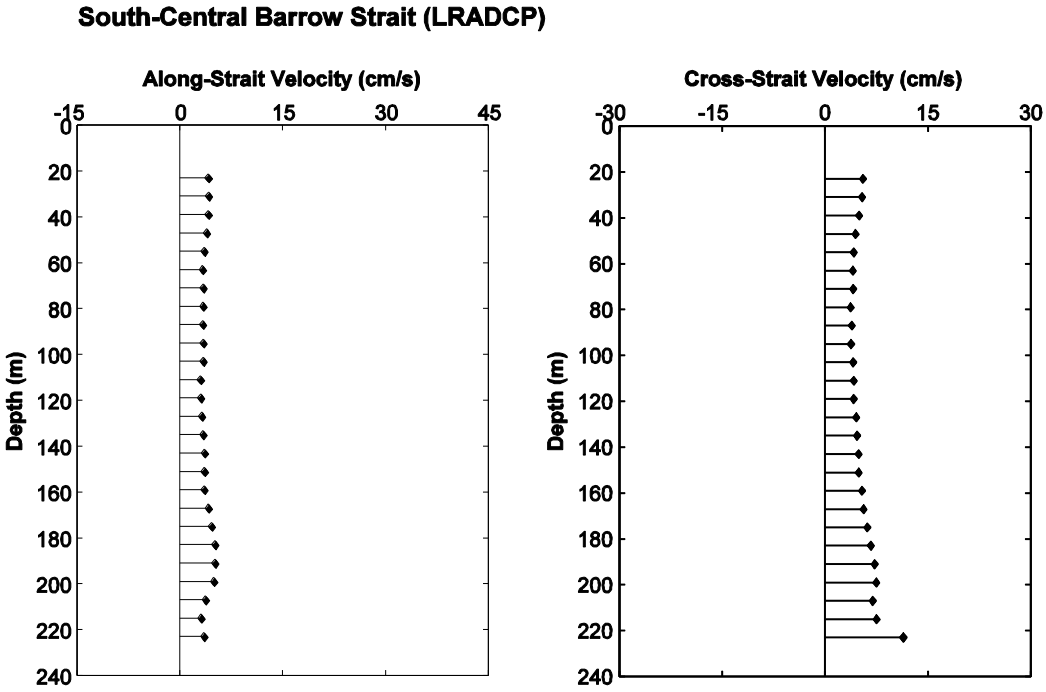


Figure 36: Variance in bi-hourly and low-pass filtered currents. Aug. 2007 to Aug. 2008.

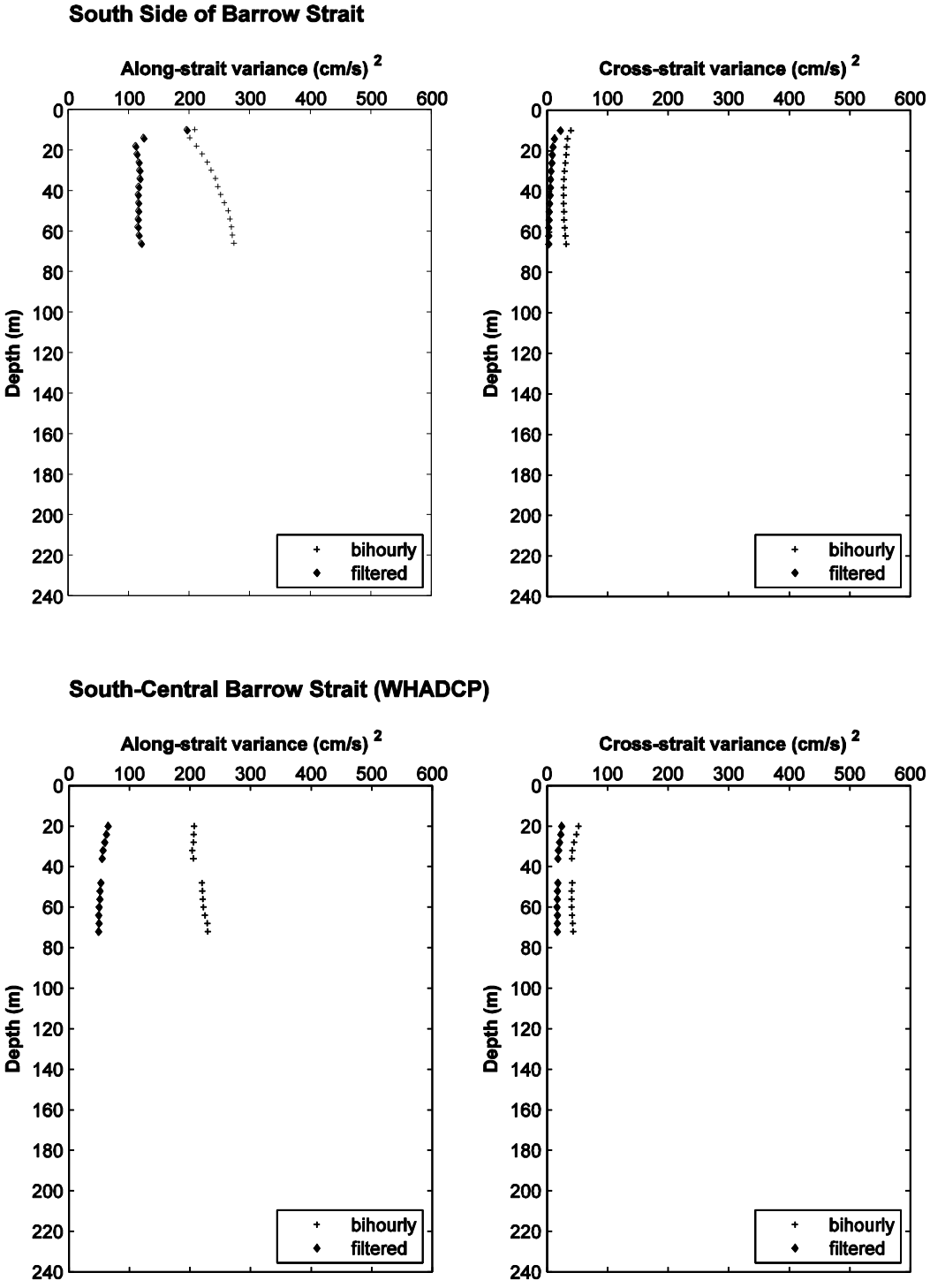


Figure 36: Variance in bi-hourly and low-pass filtered currents Aug. 2007 to Aug. 2008 (continued).

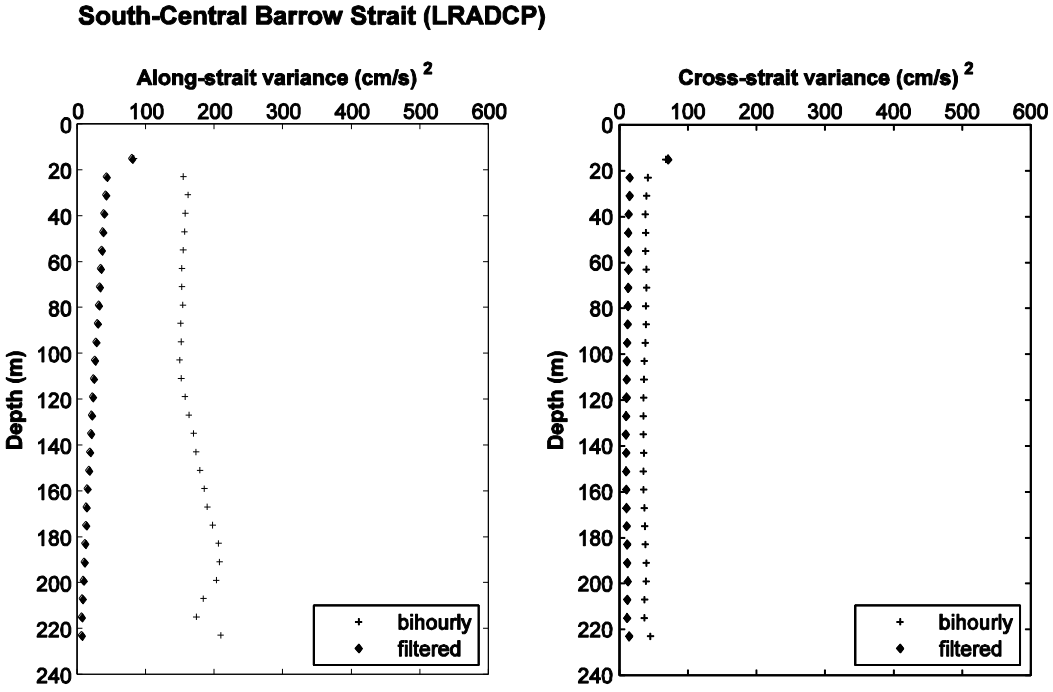
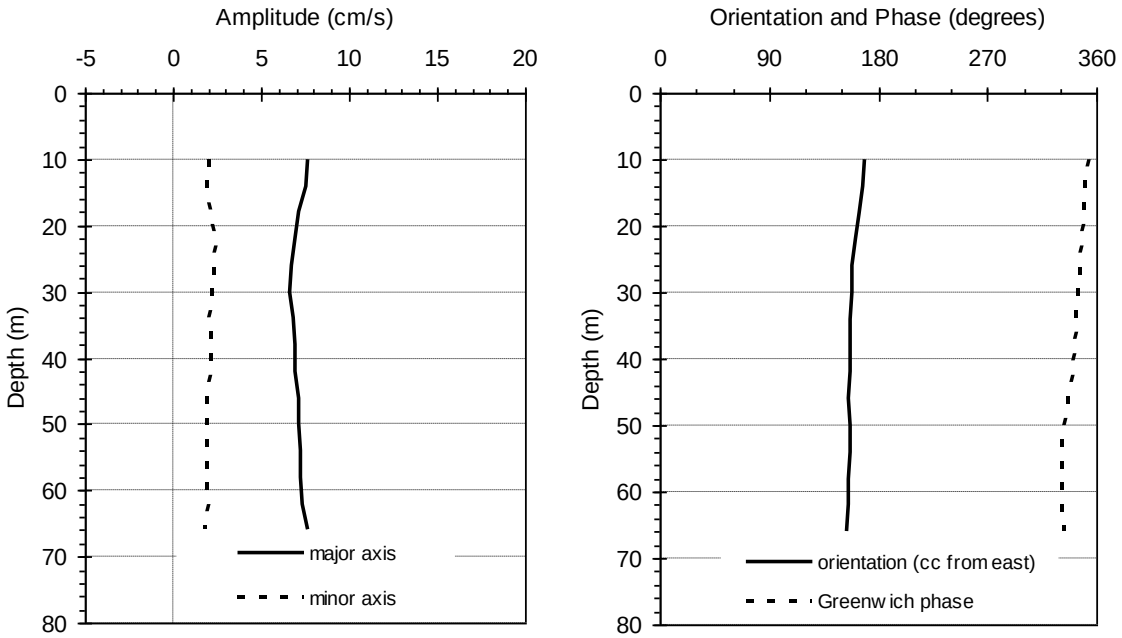


Figure 37: K1 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 01, 2007 to Oct. 17, 2007):



For Solid Ice Period (Dec. 15, 2007 to Jul 03, 2008):

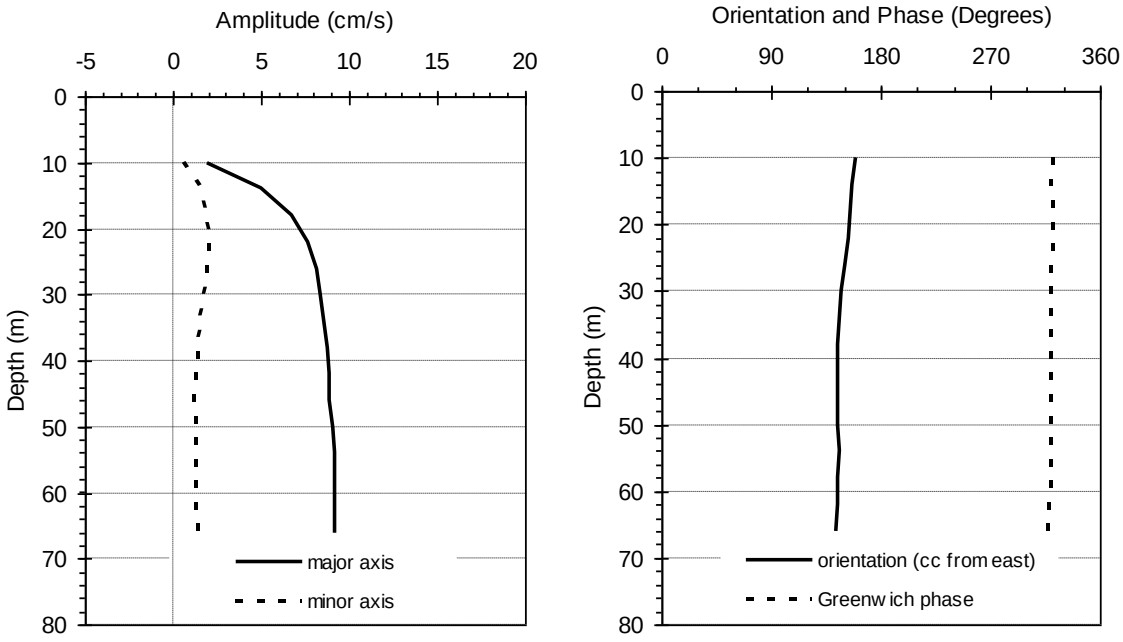
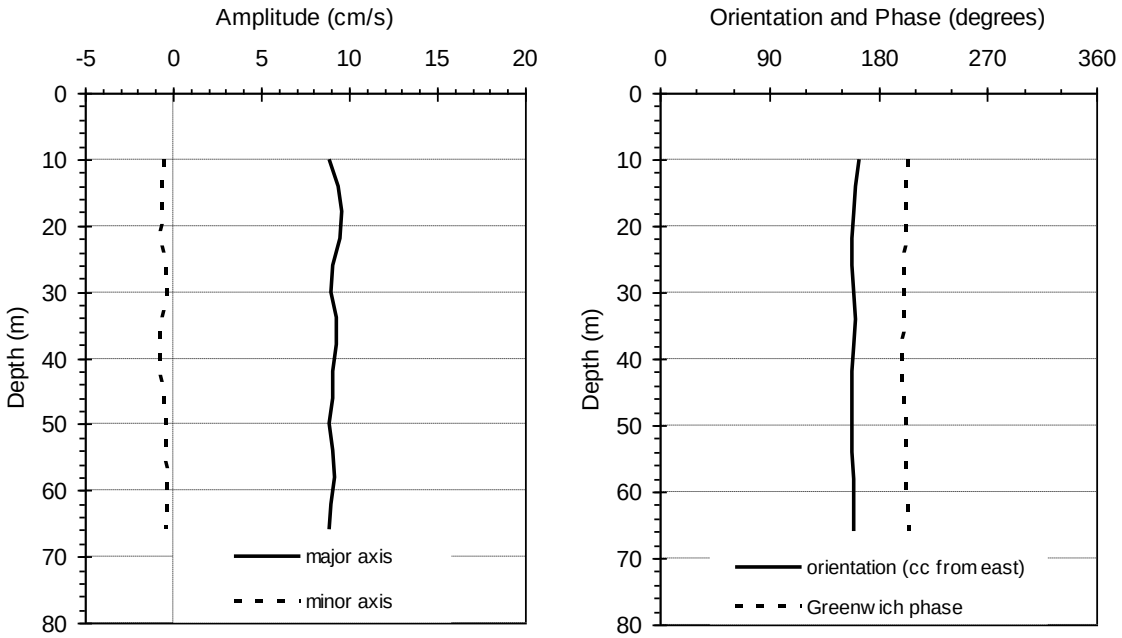


Figure 38: M2 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 01, 2007 to Oct. 17, 2007):



For Solid Ice Period (Dec. 15, 2007 to Jul 03, 2008):

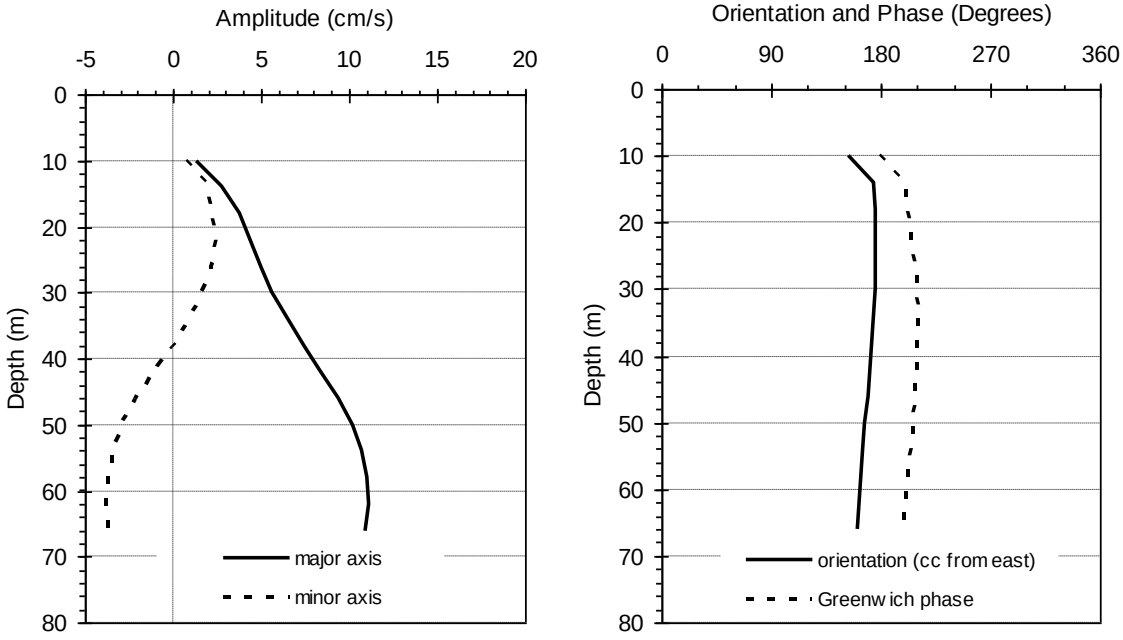
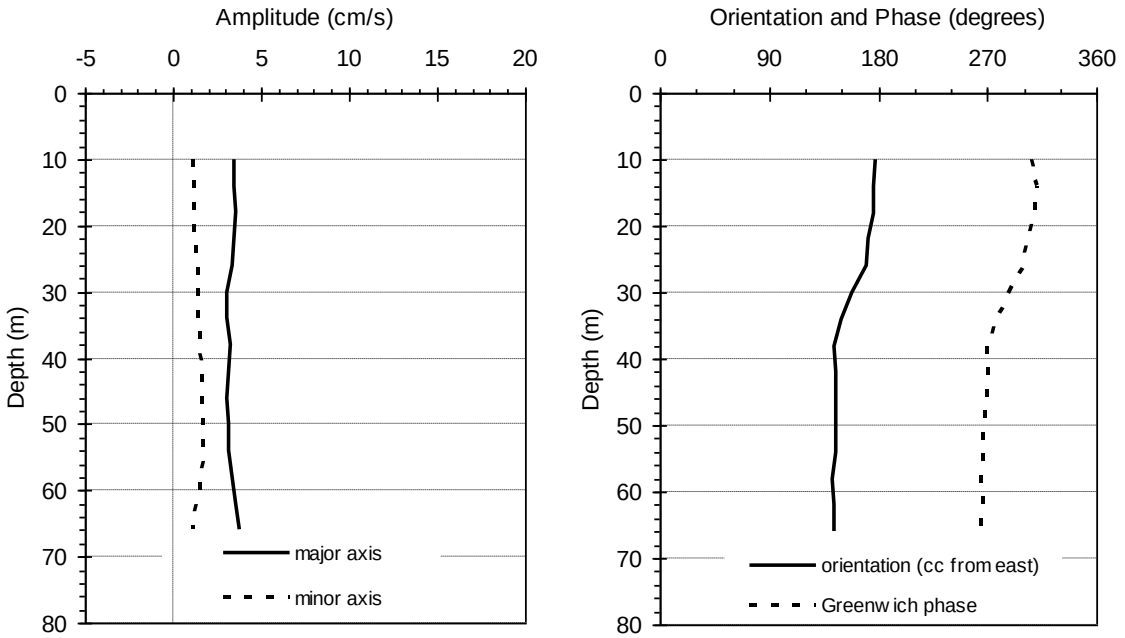


Figure 39: O1 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 01, 2007 to Oct. 17, 2007):



For Solid Ice Period (Dec. 15, 2007 to Jul 03, 2008):

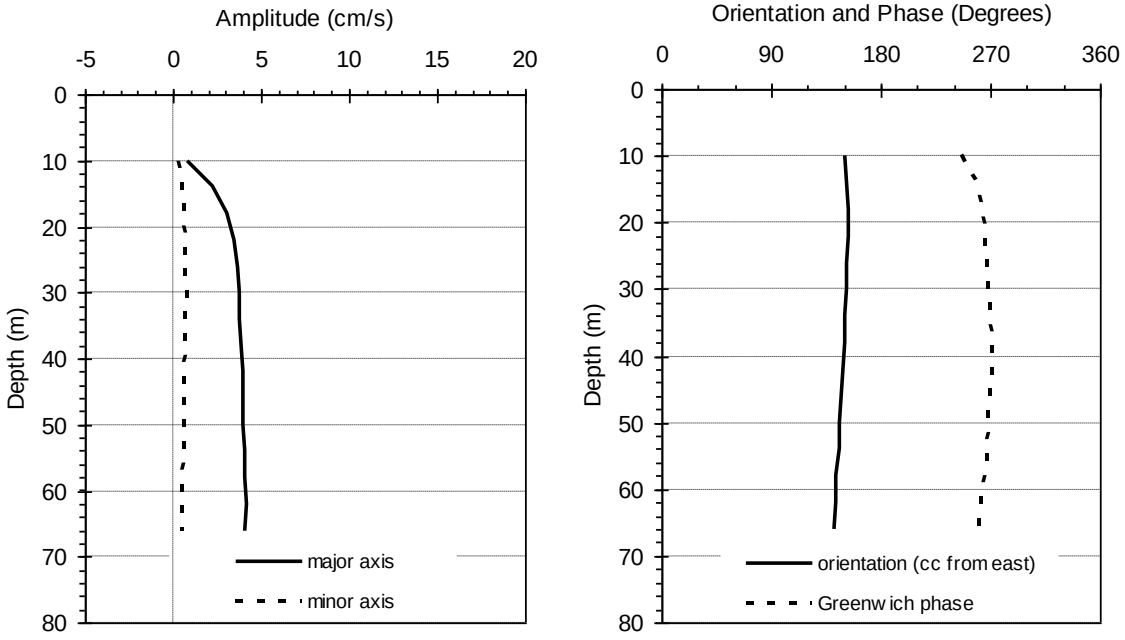
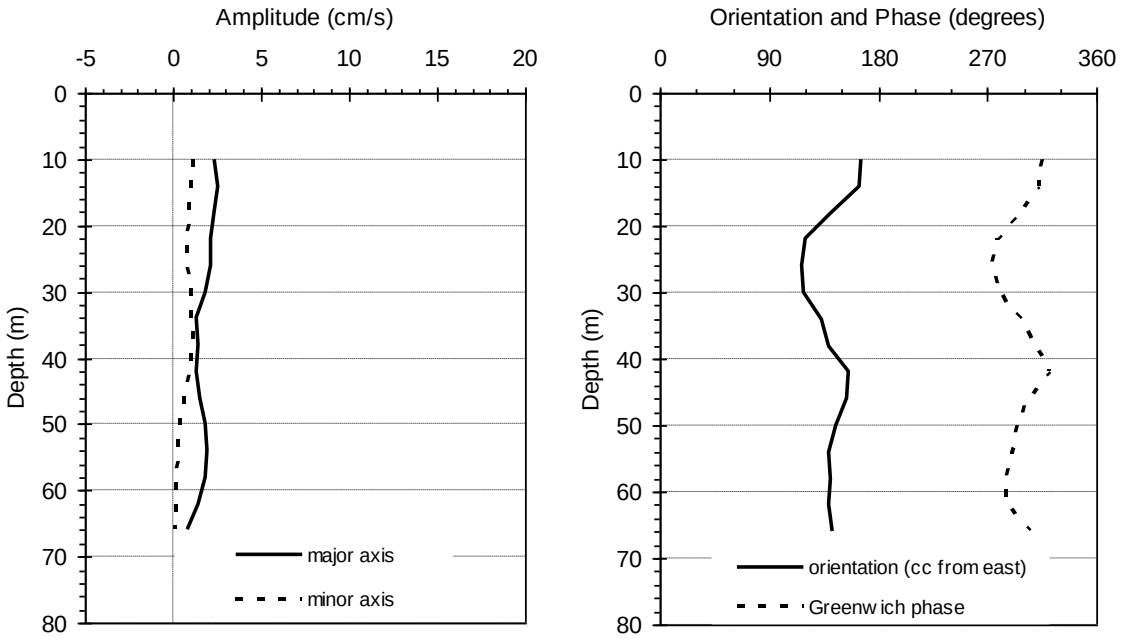


Figure 40: P1 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 01, 2007 to Oct. 17, 2007):



For Solid Ice Period (Dec. 15, 2007 to Jul 03, 2008):

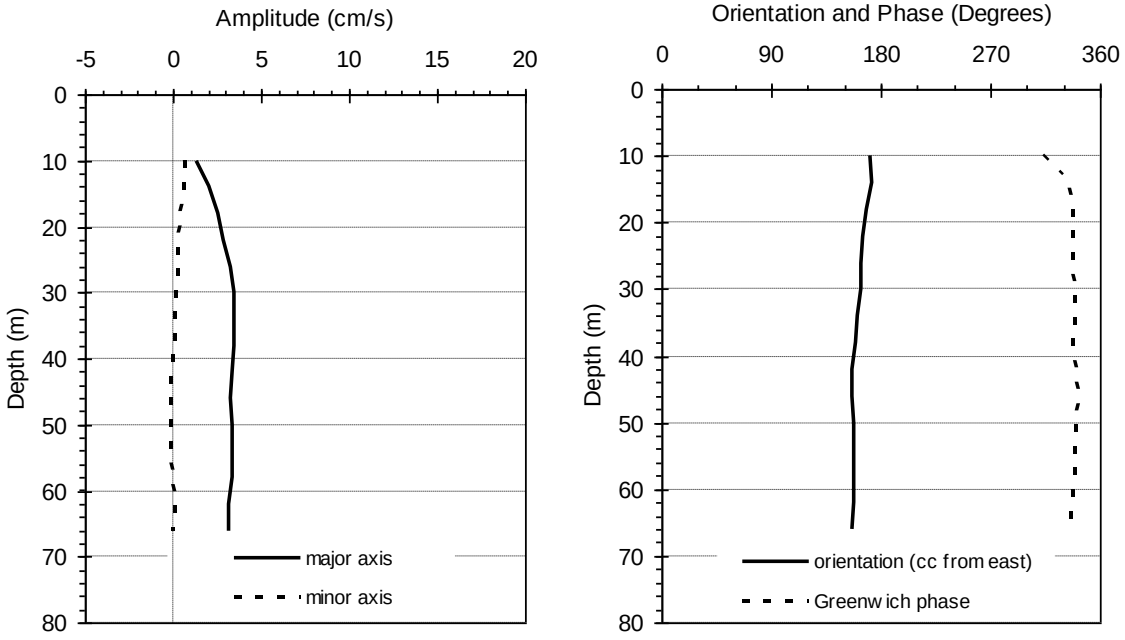
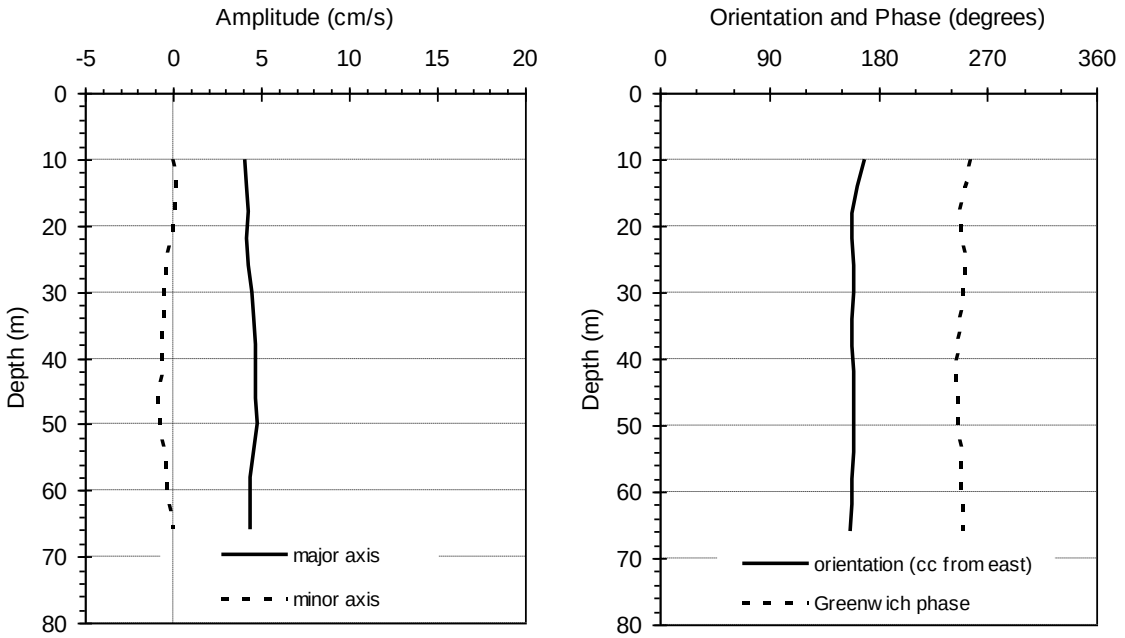


Figure 41: S2 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 01, 2007 to Oct. 17, 2007):



For Solid Ice Period (Dec. 15, 2007 to Jul 03, 2008):

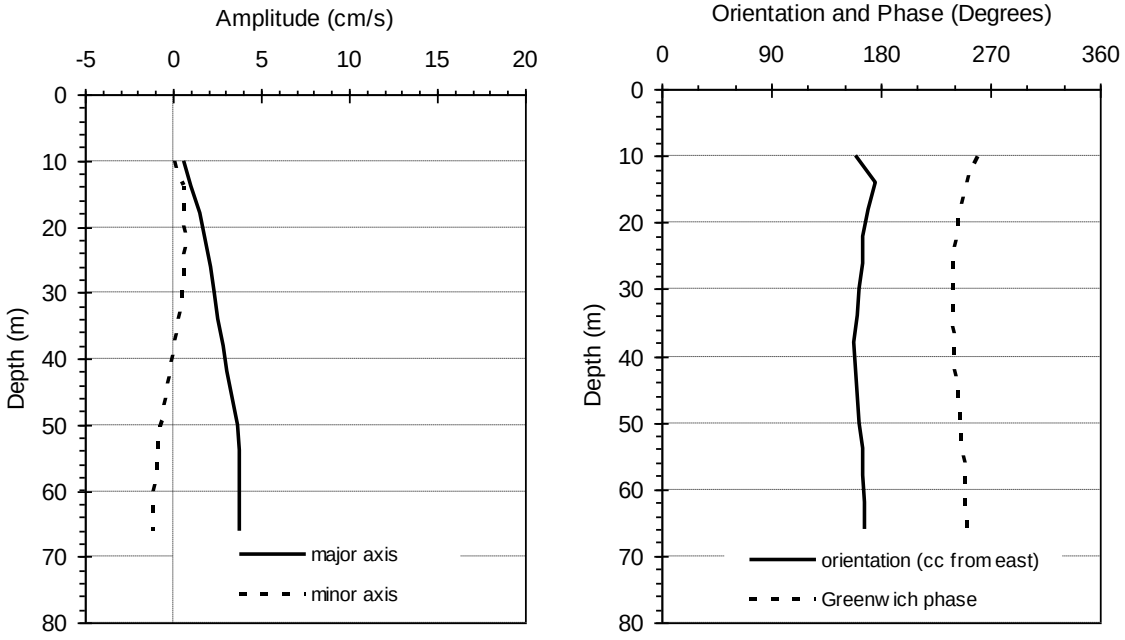
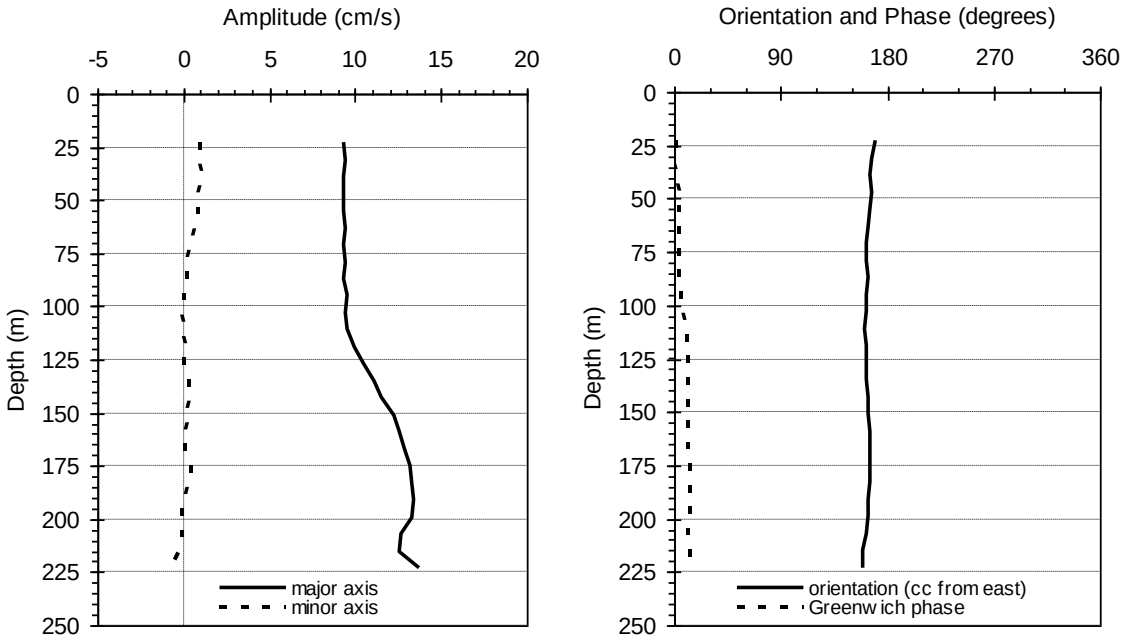


Figure 42: K1 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

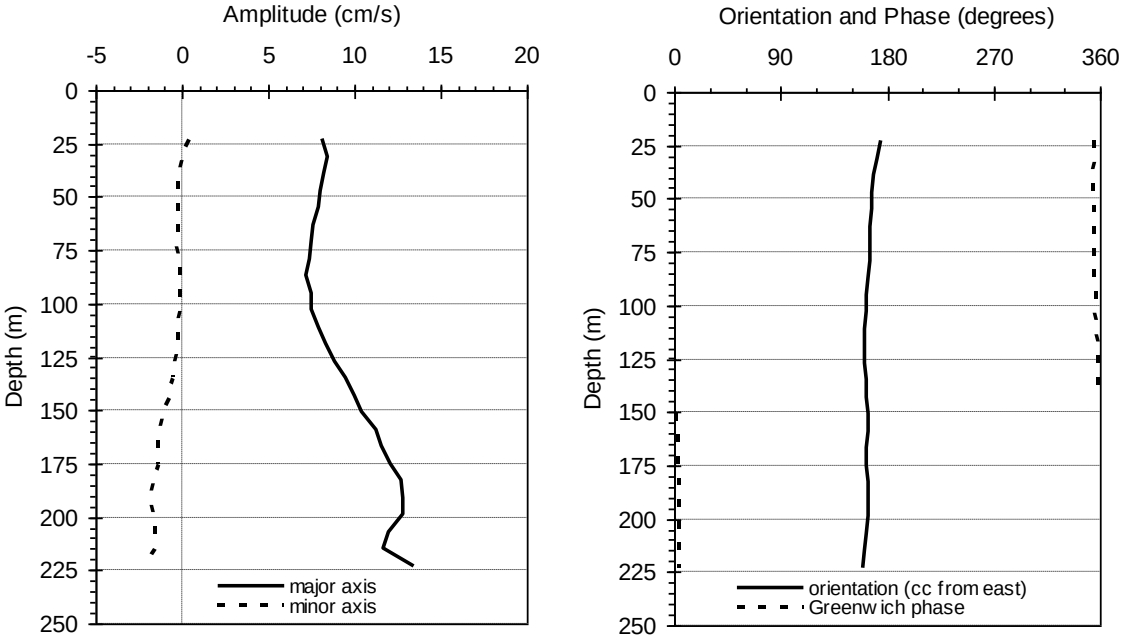
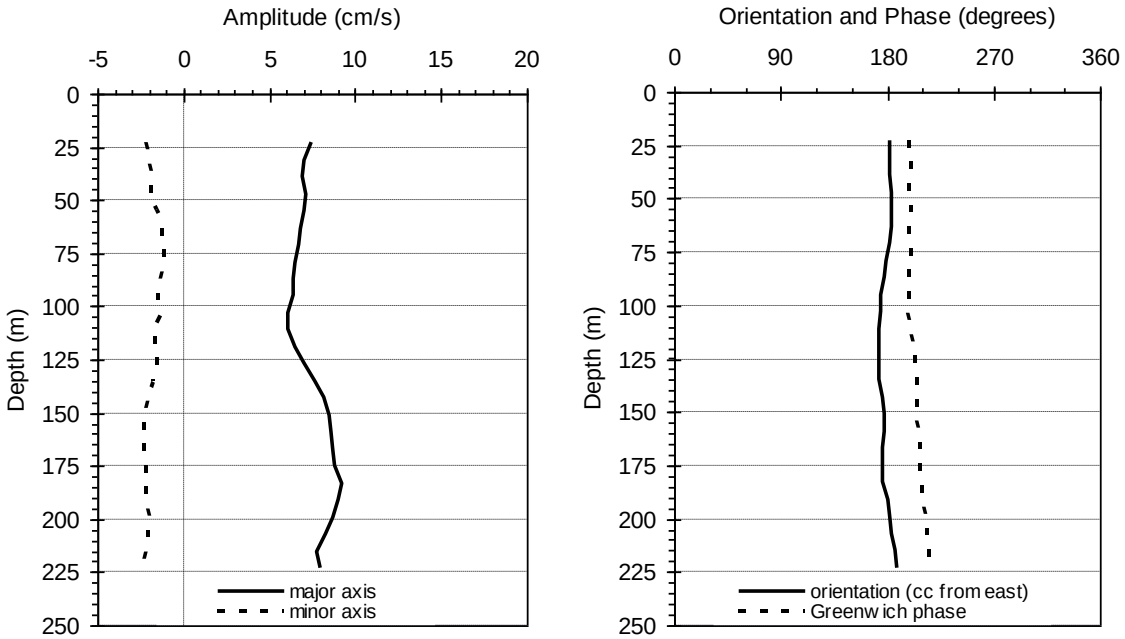


Figure 43: M2 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

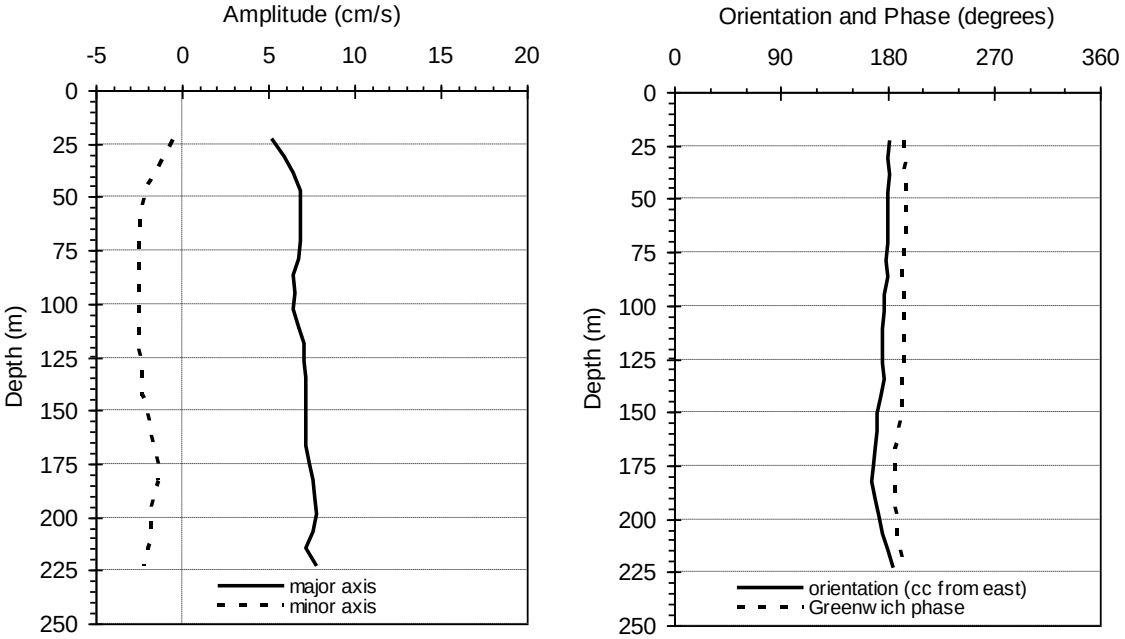
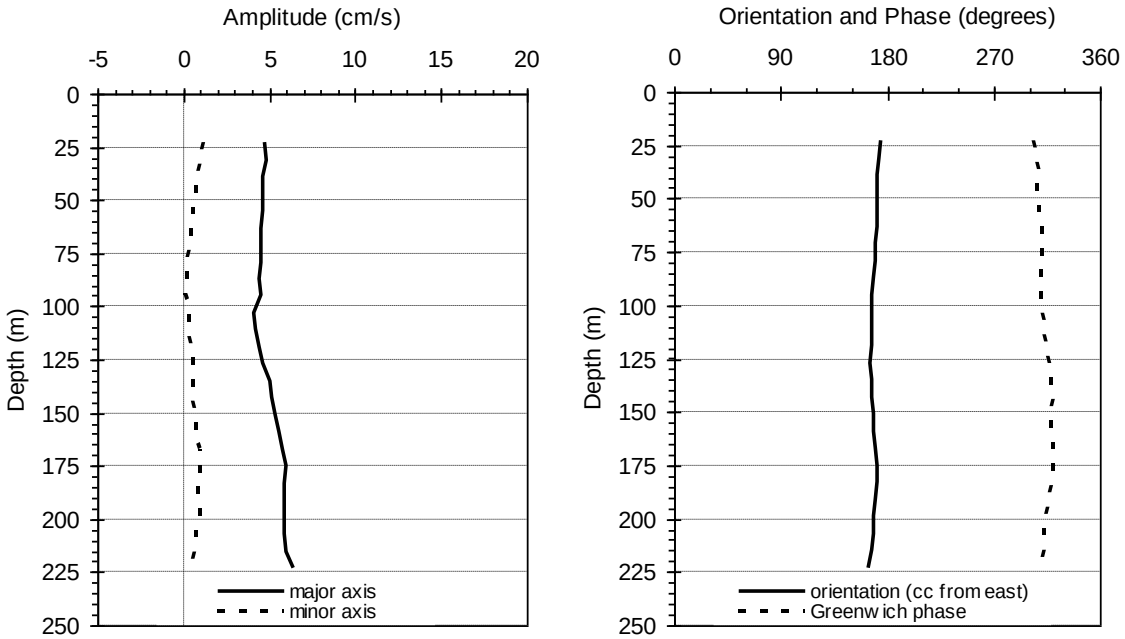


Figure 44: O1 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

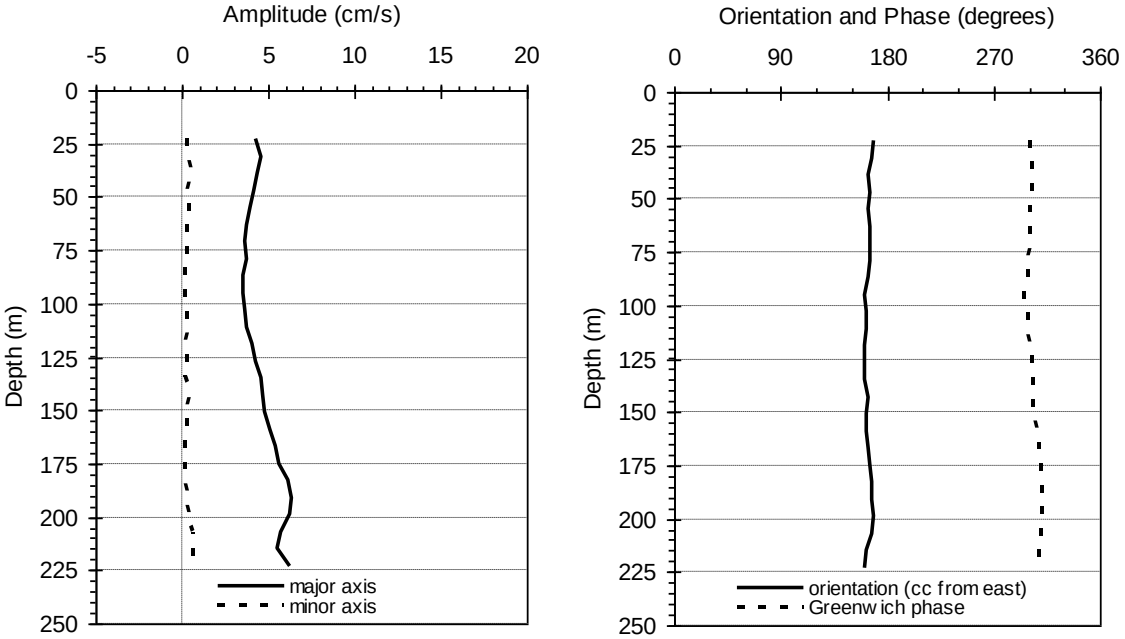
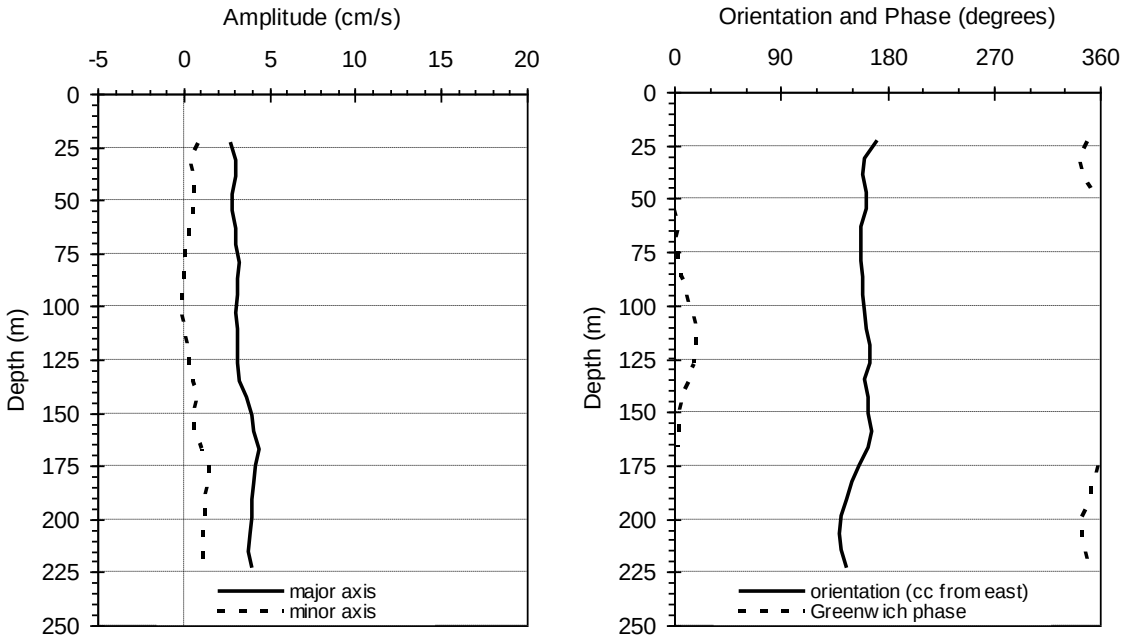


Figure 45: P1 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

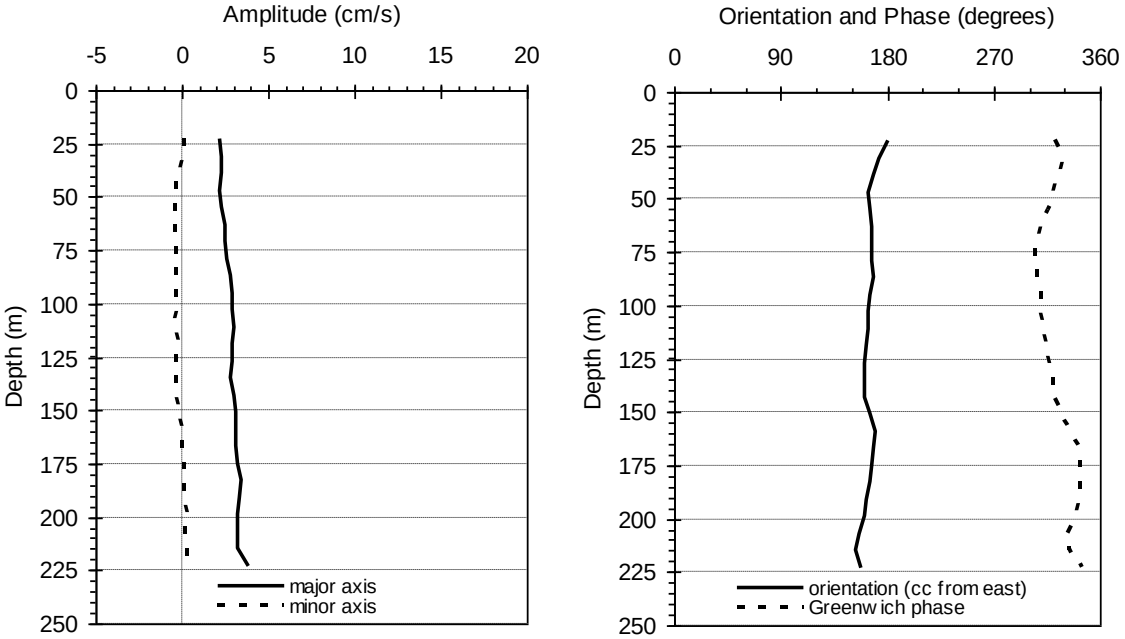
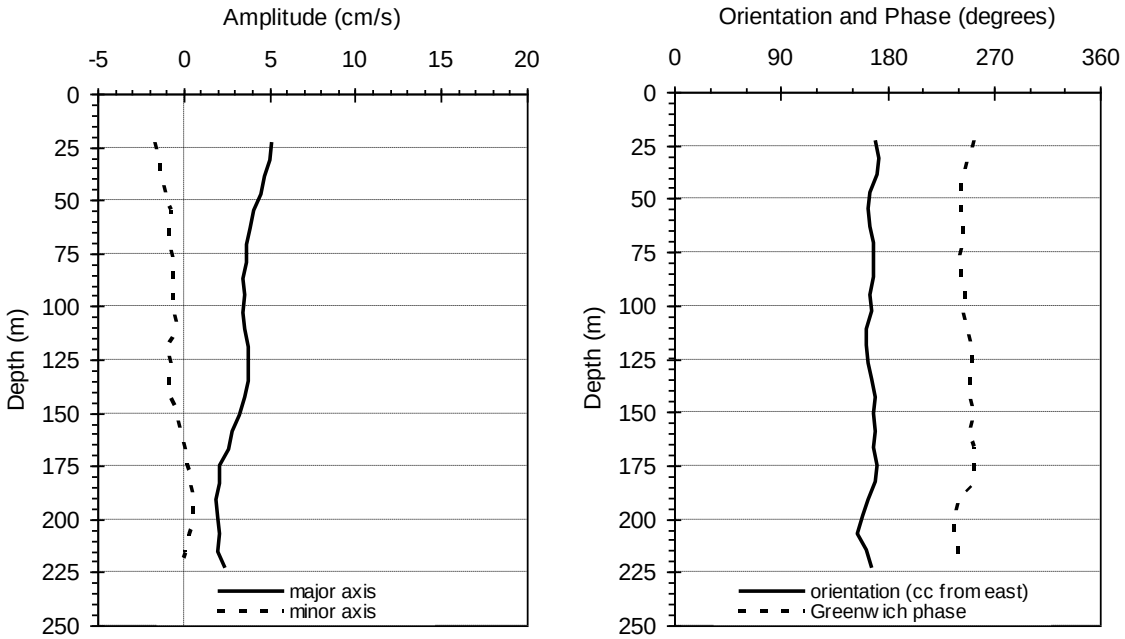


Figure 46: S2 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

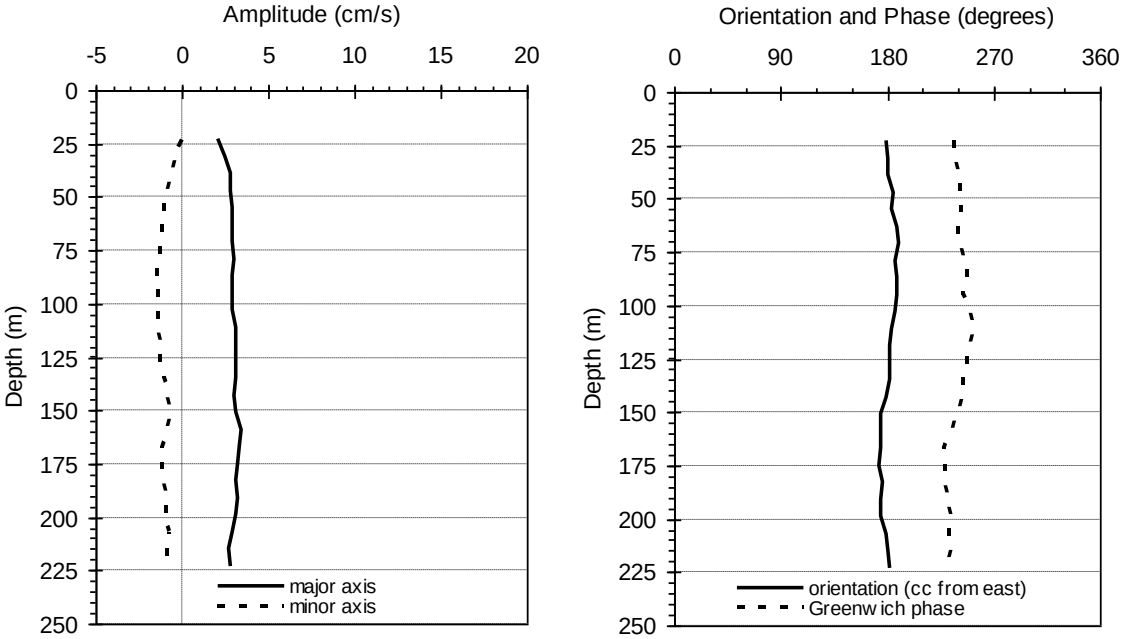
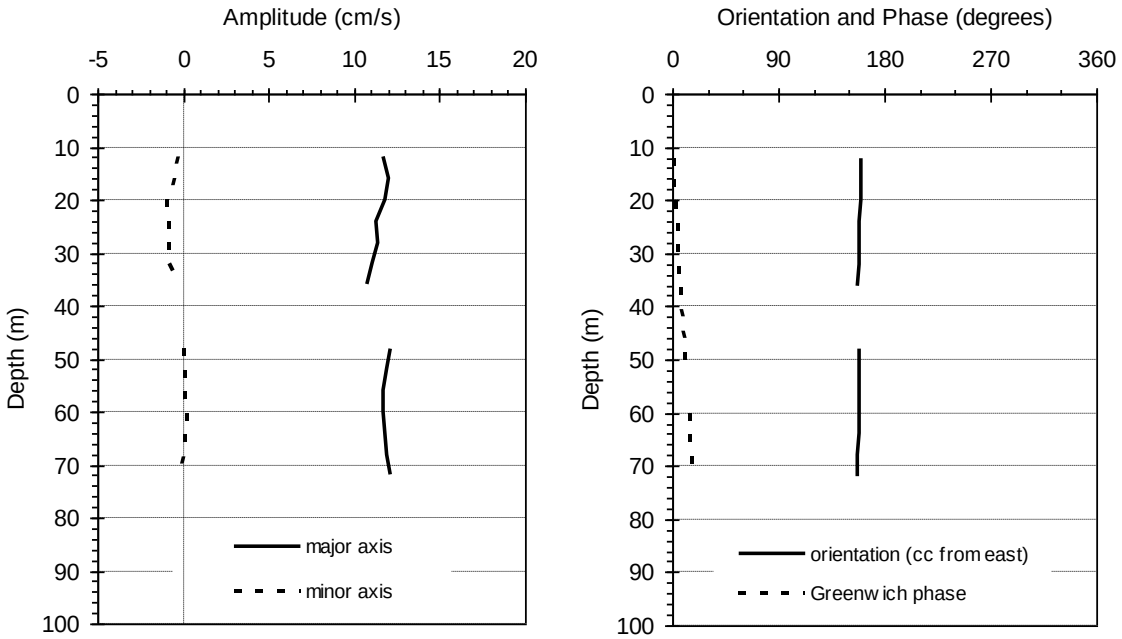


Figure 47: K1 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

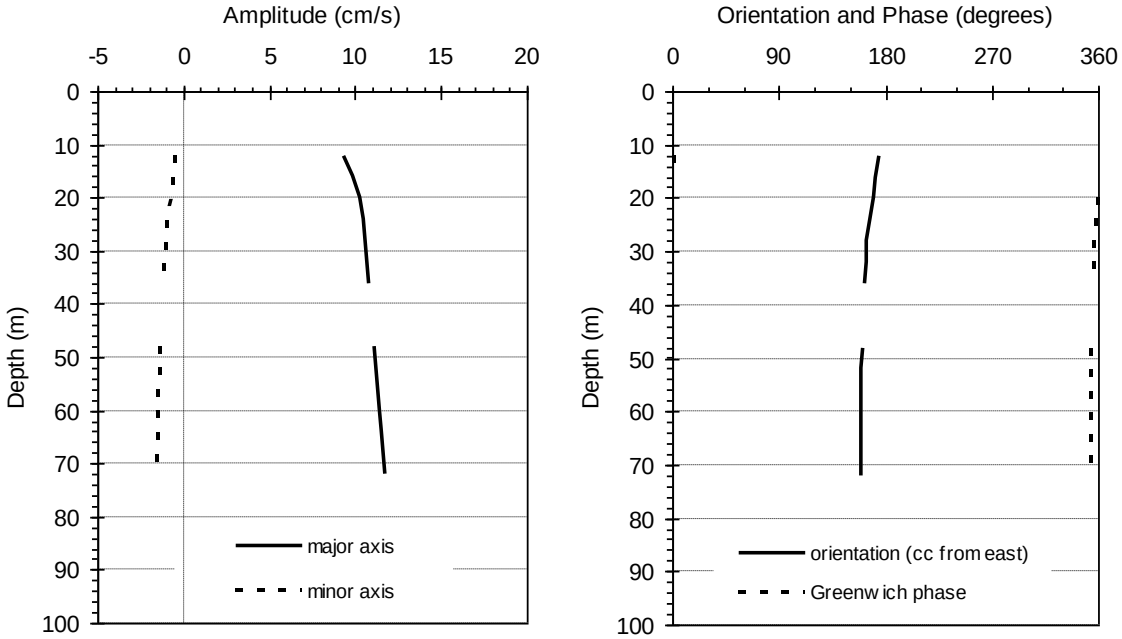
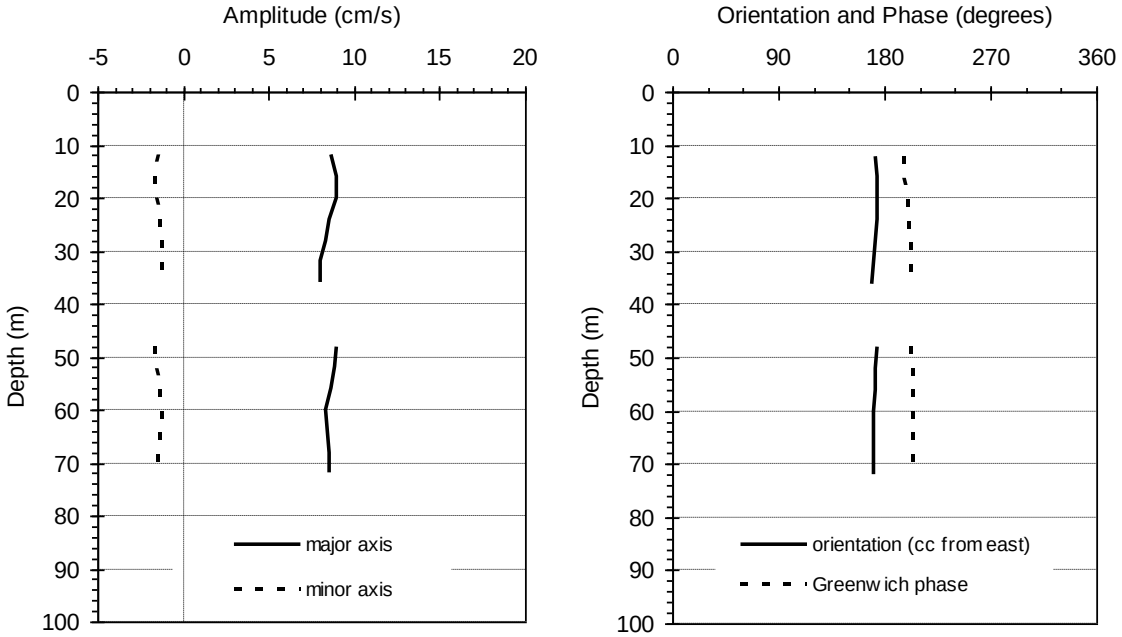


Figure 48: M2 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

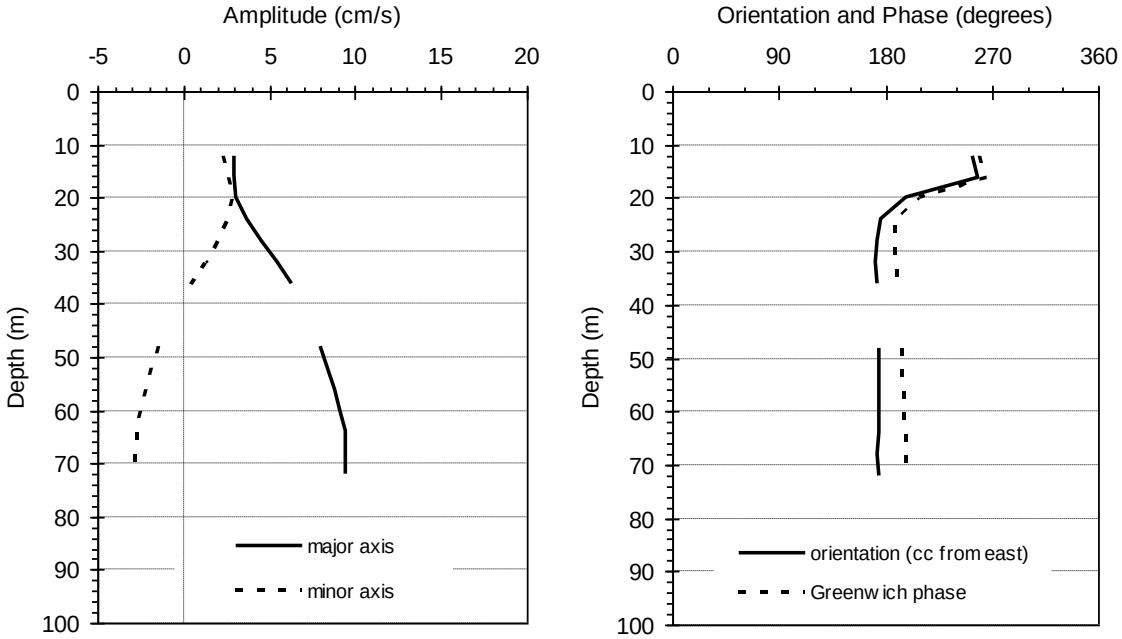
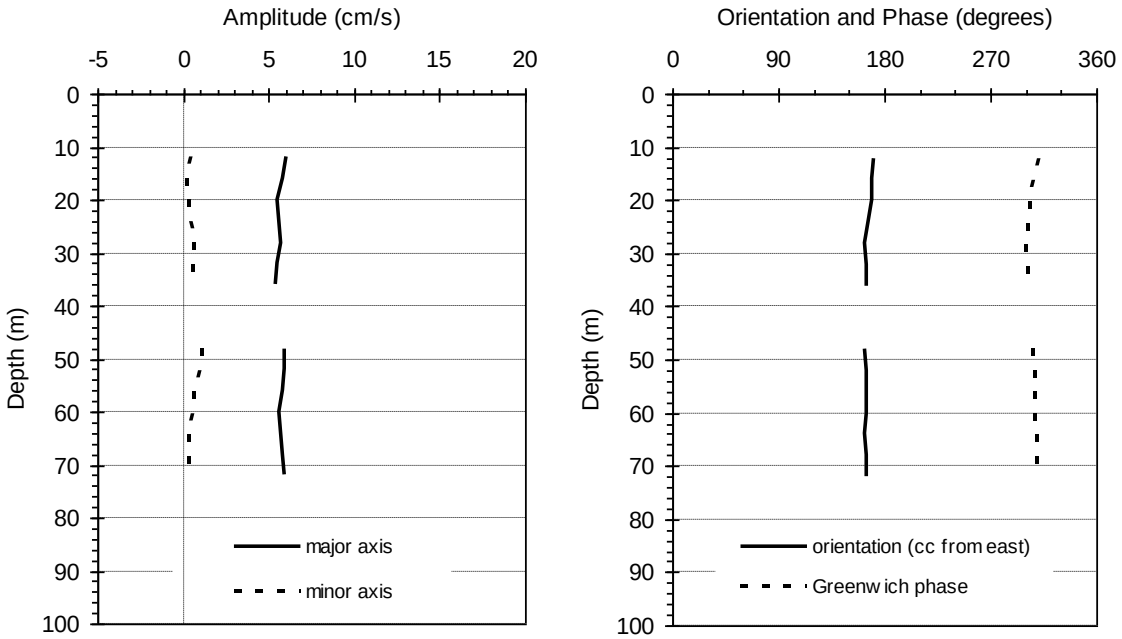


Figure 49: O1 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

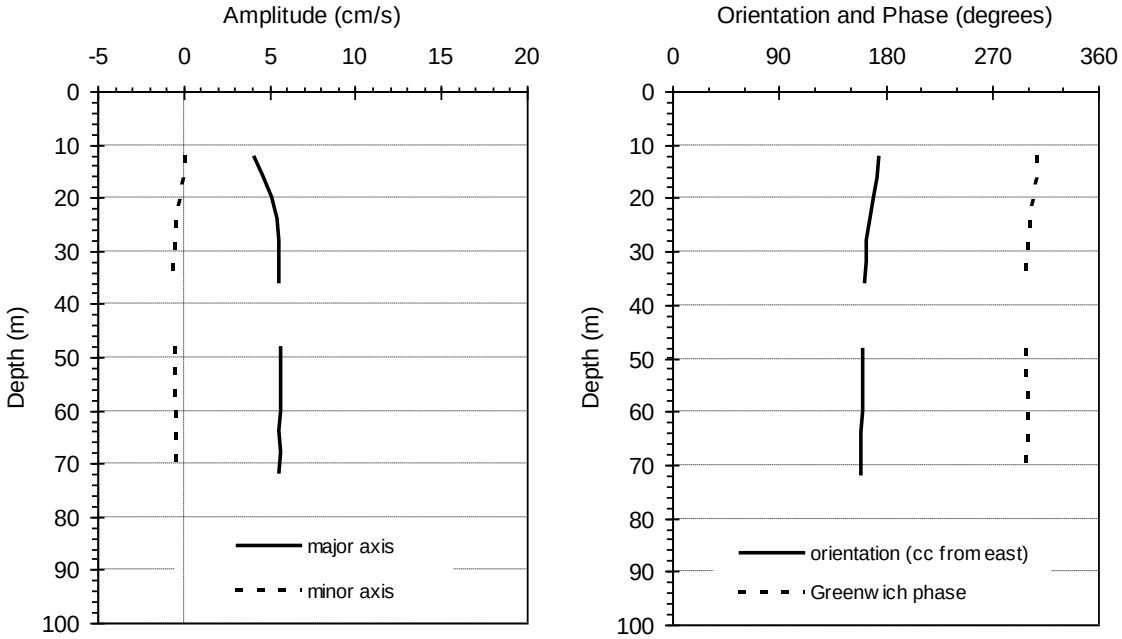
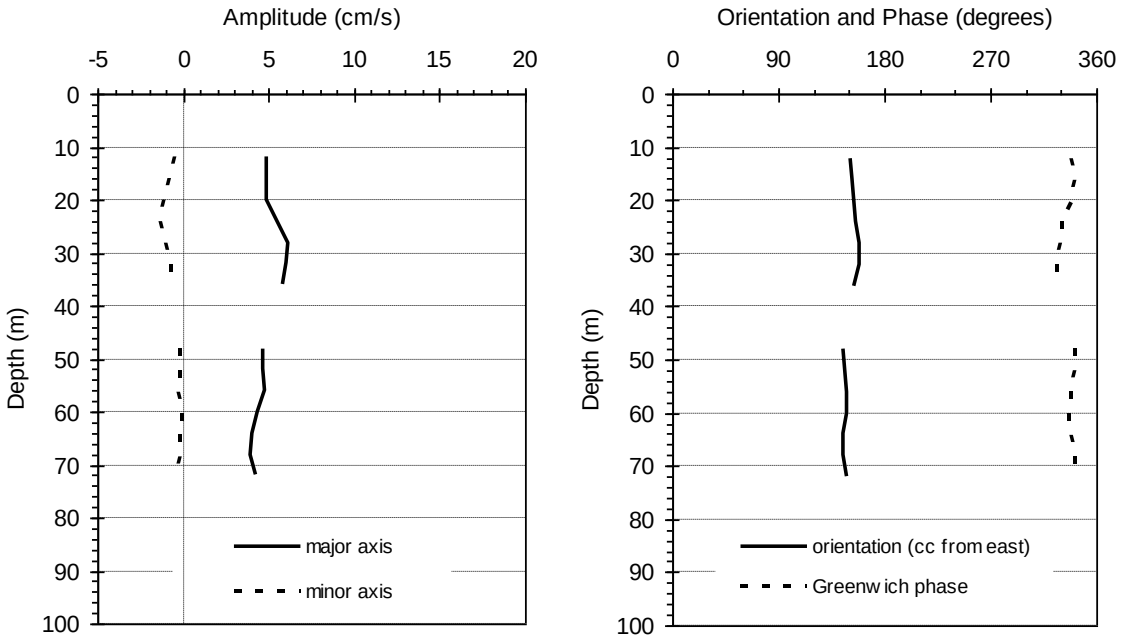


Figure 50: P1 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

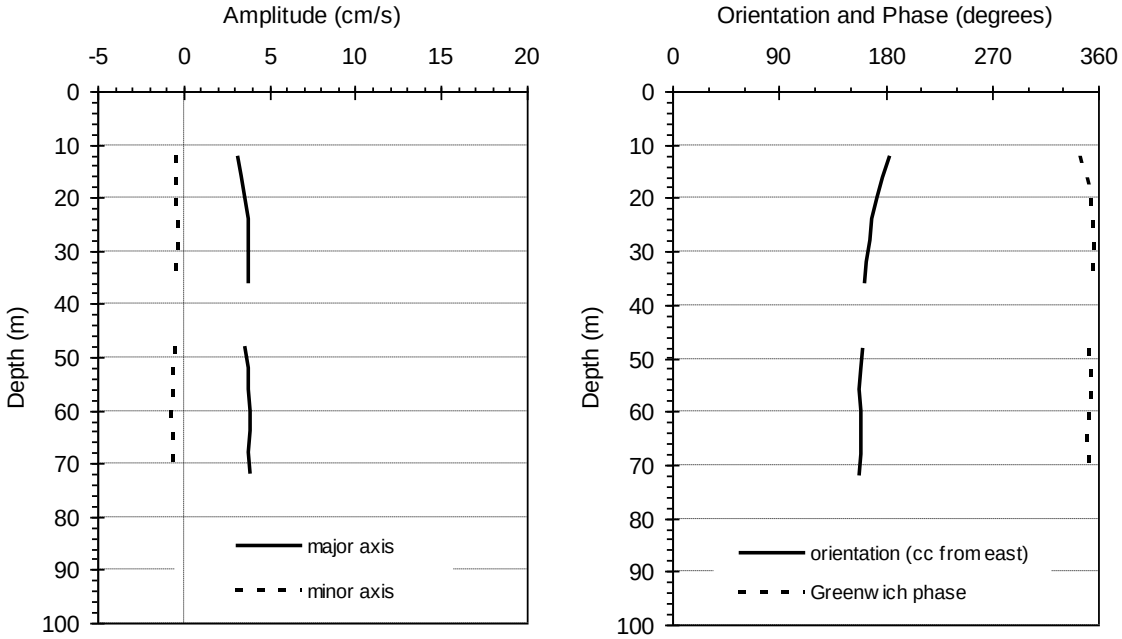
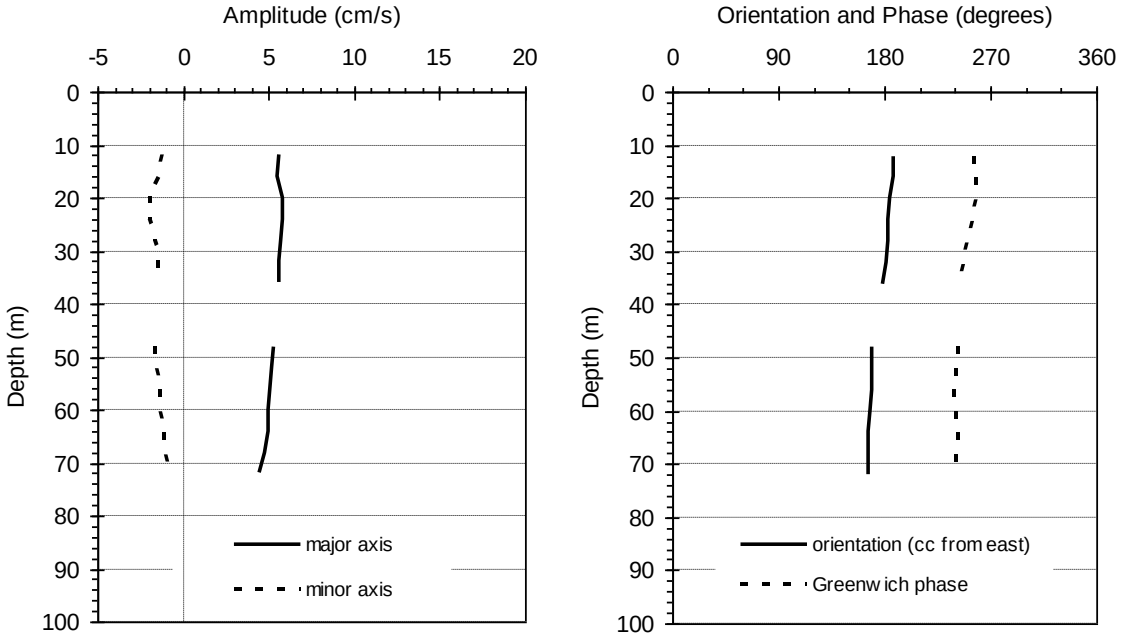


Figure 51: S2 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 02, 2007 to Oct. 20, 2007)



For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

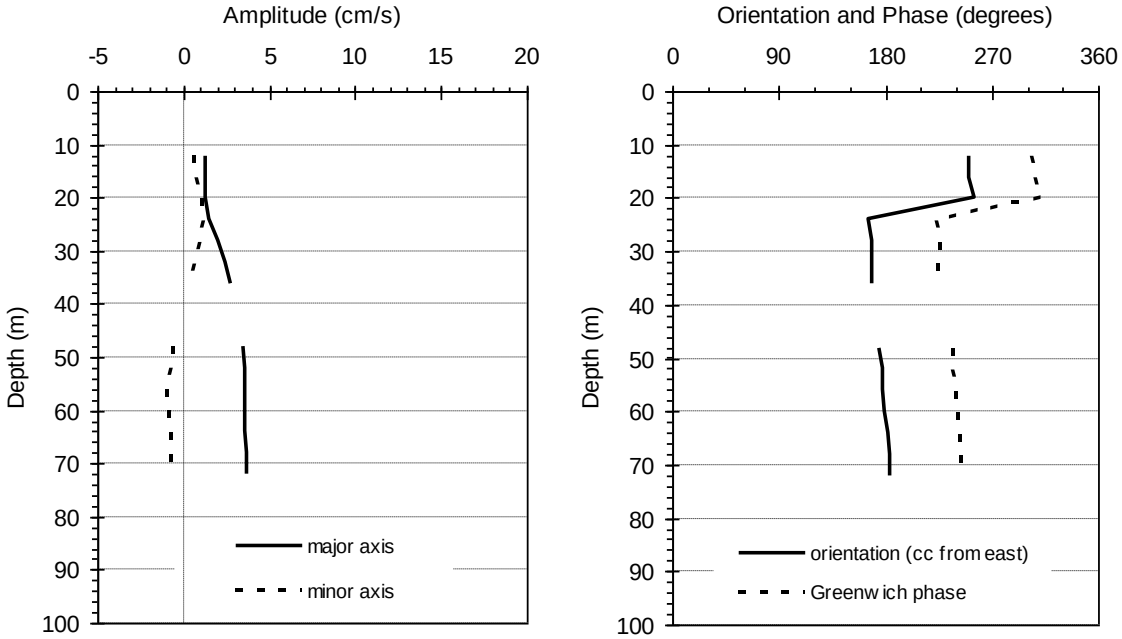


Figure 52: Ice velocity data, South side of Barrow Strait
August 2007 – August 2008

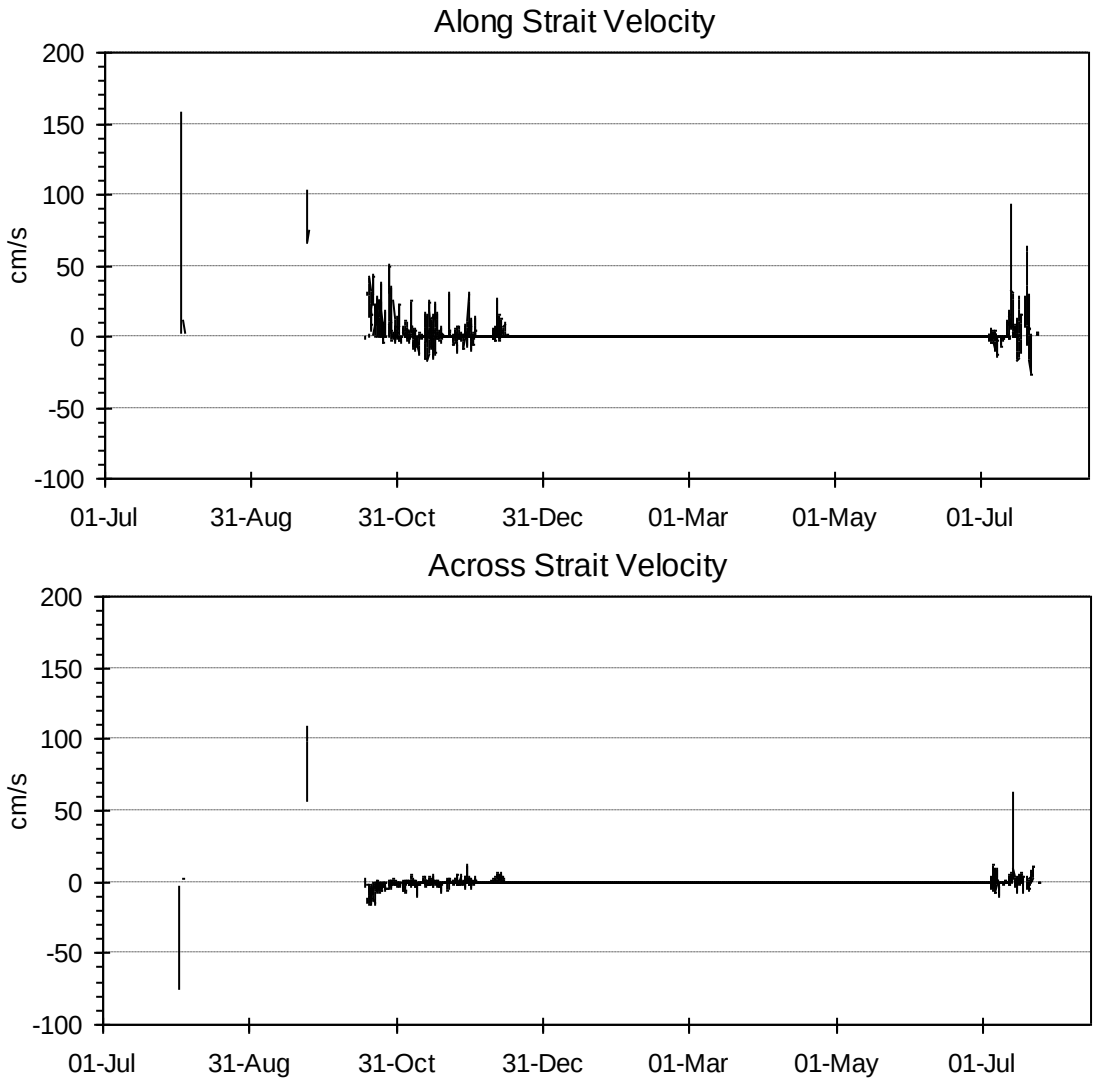


Figure 53: Ice velocity data, South-Central Barrow Strait (Workhorse ADCP) August 2007 – August 2008

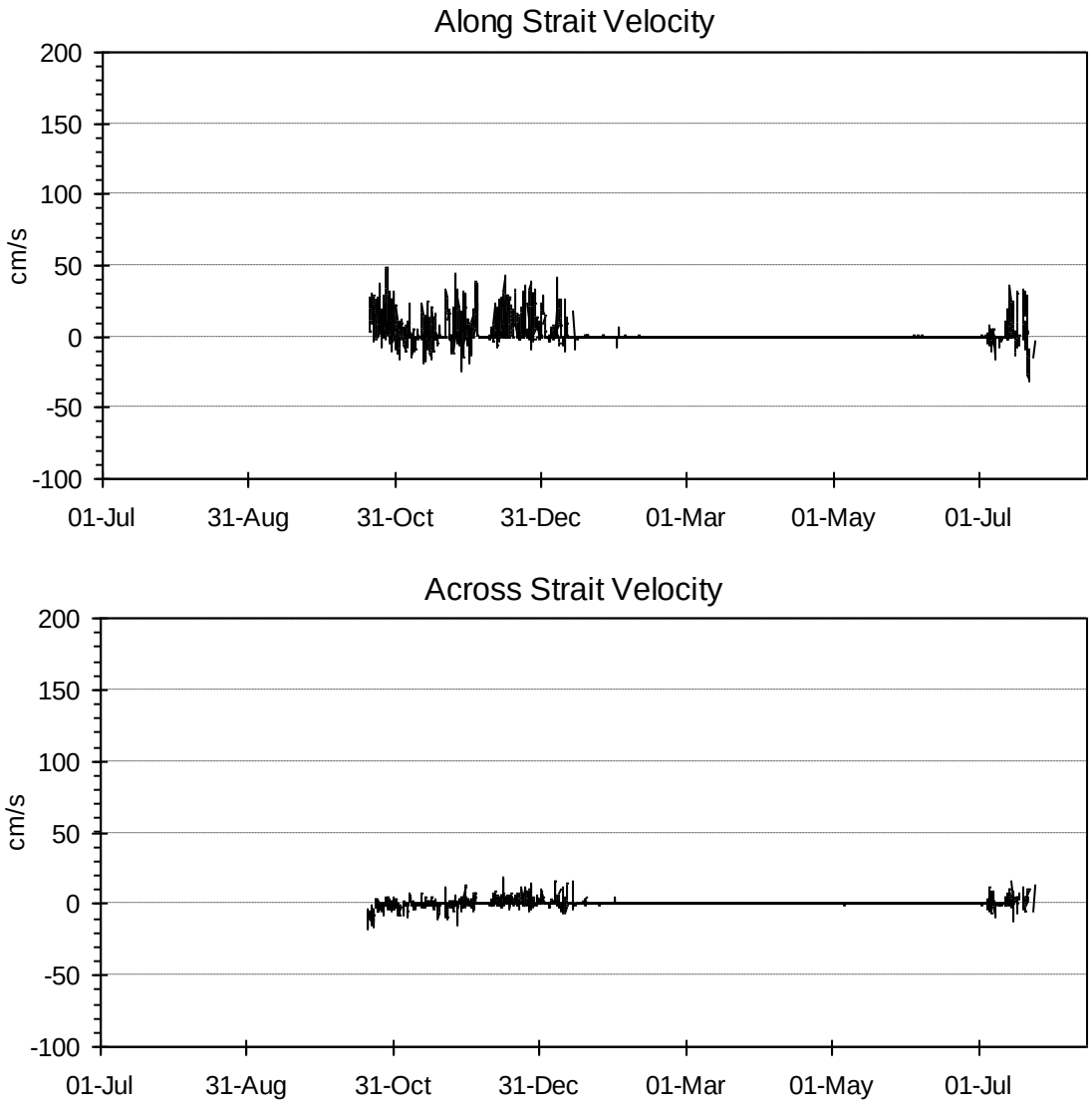


Table 1: Mooring Summary, 2007-2008

South Barrow Strait

BIO Consecutive Mooring Number	Instrument Type	Moored Depth (m)	Sounding (m)	Latitude (N)	Longitude (W)	Start Date-Time (GMT)	End Date-Time (GMT)	Sampling Interval (Seconds)
1649	BIOCYCLER	50	152	74.0832	-91.0141	02-Aug-2007 16:00	02-Aug-2008 16:00	86400
1649	MCTD	61	152	74.0832	-91.0141	01-Aug-2007 19:30	02-Aug-2008 18:00	1800
1650	WHADCP	72	147	74.0830	-91.0528	01-Aug-2007 16:00	02-Aug-2008 16:00	7200
1650	MCTD	74	147	74.0830	-91.0528	01-Aug-2007 15:30	02-Aug-2008 16:30	1800
1650	MCTD	143	147	74.0830	-91.0528	01-Aug-2007 15:30	02-Aug-2008 16:30	1800
1651	MCTD	33	148	74.0814	-91.0343	01-Aug-2007 18:00	02-Aug-2008 17:30	1800
1651	Water sampler	35	148	74.0814	-91.0343	15-Aug-2007 23:59		24 days

South-Central Barrow Strait

BIO Consecutive Mooring Number	Instrument Type	Moored Depth (m)	Sounding (m)	Latitude (N)	Longitude (W)	Start Date-Time (GMT)	End Date-Time (GMT)	Sampling Interval (Seconds)
1652	LRADCP	240	270	74.1958	-90.8486	02-Aug-2007 20:00	02-Aug-2008 20:00	7200
1652	MCTD	262	270	74.1958	-90.8486	02-Aug-2007 19:00	02-Aug-2008 21:30	1800
1653	MCTD	40	269	74.1991	-90.8459	02-Aug-2007 18:30	02-Aug-2008 19:30	1800
1653	WHADCP	78	269	74.1991	-90.8459	02-Aug-2007 20:00	02-Aug-2008 18:00	7200
1653	MCTD	162	269	74.1991	-90.8459	02-Aug-2007 18:30	02-Aug-2008 19:30	1800
1654	IPS	55	271	74.1945	-90.8640	Instrument Lost		2
1654	MCTD	80	271	74.1945	-90.8640			1800

ArcticNet

BIO Consecutive Mooring Number	Instrument Type	Moored Depth (m)	Sounding (m)	Latitude (N)	Longitude (W)	Start Date-Time (GMT)	End Date-Time (GMT)	Sampling Interval (Seconds)
1655	MCTD	42	274	74.4673	-90.3780	04-Aug-2007 21:00	03-Aug-2008 12:30	7200

Table 2: South Barrow Strait, Microcat/ADCP statistical summary
Late summer: August 1, 2007 - September 20, 2007

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
33	34	-0.67	0.74	-1.51	2.56	31.82	0.32	30.40	32.73	25.56	0.27	24.32	26.31	16.02	18.81	-28.42	72.00	1.02	7.28	-24.76	36.40
61	62	-1.26	0.24	-1.58	0.34	32.41	0.20	31.65	32.91	26.06	0.17	25.40	26.47	12.45	17.25	-34.24	63.63	0.84	5.63	-18.59	20.42
74	66	-1.37	0.14	-1.62	-0.78	32.54	0.16	32.03	32.97	26.17	0.13	25.75	26.52	11.46	16.93	-33.67	59.90	0.90	5.50	-16.89	19.17
143		-1.40	0.13	-1.61	-0.93	33.09	0.21	32.69	33.55	26.62	0.17	26.29	26.98								

Table 3: South-Central Barrow Strait, Microcat/ADCP statistical summary
Late summer: August 2, 2007 - September 20, 2007

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	36	-0.73	0.91	-1.54	2.33	32.26	0.38	31.26	32.93	25.92	0.34	25.01	26.49	3.82	16.19	-42.07	49.15	3.32	9.55	-24.57	35.57
	72													2.73	14.92	-32.82	44.13	3.38	8.27	-22.51	27.90
162	159	-1.35	0.15	-1.57	-0.91	33.29	0.18	32.84	33.64	26.78	0.14	26.42	27.05	1.27	12.57	-26.92	34.38	4.70	6.03	-10.79	25.23
262	223	-0.57	0.11	-1.10	-0.34	33.75	0.05	33.50	33.86	27.12	0.04	26.93	27.20	0.83	13.41	-32.86	34.17	7.53	6.38	-8.14	28.88

Table 4: South Barrow Strait, Microcat/ADCP statistical summary
Fall: September 21, 2007 – December 20, 2007

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
33	34	-1.36	0.60	-1.76	0.61	31.56	0.36	30.13	32.21	25.37	0.30	24.22	25.91	3.07	16.80	-40.14	69.57	-0.17	5.02	-19.07	17.67
61	62	-1.33	0.27	-1.76	-0.55	32.20	0.22	31.00	32.75	25.89	0.18	24.91	26.34	-0.22	17.51	-50.05	58.96	0.45	5.28	-19.02	14.99
74	66	-1.36	0.16	-1.75	-0.57	32.47	0.22	31.47	33.18	26.11	0.18	25.30	26.69	-0.58	18.11	-53.10	57.57	0.56	5.51	-16.22	15.13
143		-0.91	0.35	-1.50	-0.02	33.49	0.29	32.67	33.98	26.92	0.23	26.28	27.29								

Table 5: South-Central Barrow Strait, Microcat/ADCP statistical summary
Fall: September 21, 2007 – December 20, 2007

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	36	-1.37	0.36	-1.76	-0.04	31.75	0.52	30.56	32.63	25.53	0.42	24.57	26.21	0.70	14.84	-35.04	42.38	1.00	6.29	-25.79	27.80
	72													-0.67	16.12	-46.08	42.40	1.29	7.08	-21.01	29.00
162	159	-1.13	0.26	-1.52	0.06	33.45	0.17	32.93	34.03	26.90	0.13	26.49	27.32	1.25	14.54	-31.43	50.79	5.46	6.46	-14.22	26.60
262	223	-0.25	0.26	-0.99	0.24	33.88	0.10	33.53	34.10	27.22	0.07	26.96	27.37	1.68	13.37	-37.60	44.79	9.03	6.50	-12.93	31.26

Table 6: South Barrow Strait, Microcat/ADCP statistical summary
Winter: December 21, 2007 – March 20, 2008

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
33	34	-1.73	0.03	-1.77	-1.50	32.30	0.12	31.98	32.53	25.99	0.10	25.73	26.17	6.44	11.16	-25.67	37.66	-0.19	4.08	-14.59	12.40
61	62	-1.56	0.13	-1.78	-1.24	32.54	0.11	31.99	32.75	26.18	0.09	25.73	26.35	7.04	13.89	-38.86	49.47	0.03	5.51	-17.81	15.48
74	66	-1.50	0.14	-1.78	-1.25	32.63	0.06	32.14	32.83	26.25	0.05	25.85	26.41	7.15	13.89	-38.58	48.37	0.08	5.68	-19.15	18.01
143		-1.21	0.15	-1.43	-0.61	33.10	0.23	32.72	33.72	26.62	0.18	26.32	27.10								

Table 7: South-Central Barrow Strait, Microcat/ADCP statistical summary
Winter: December 21, 2007 – March 20, 2008

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	36	-1.73	0.04	-1.79	-1.44	32.41	0.21	31.96	32.82	26.07	0.17	25.71	26.40	7.27	12.95	-33.28	45.28	2.08	5.02	-20.42	18.66
	72													5.38	14.24	-32.34	44.44	1.93	5.96	-19.58	24.66
162	159	-1.23	0.12	-1.72	-0.79	33.26	0.15	32.85	33.65	26.75	0.12	26.42	27.05	4.19	15.09	-33.87	42.79	5.77	5.96	-12.04	24.09
262	223	-0.35	0.23	-1.09	0.07	33.81	0.11	33.32	34.01	27.16	0.08	26.79	27.32	2.98	14.92	-37.31	46.31	9.61	6.22	-6.72	30.30

Table 8: South Barrow Strait, Microcat/ADCP statistical summary
Spring: March 21, 2008 – June 20, 2008

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
33	34	-1.76	0.02	-1.79	-1.67	32.53	0.04	32.38	32.68	26.17	0.04	26.05	26.29	4.03	11.97	-34.20	37.60	-0.34	4.43	-14.51	13.35
61	62	-1.71	0.05	-1.79	-1.56	32.67	0.05	32.51	32.81	26.28	0.04	26.16	26.40	2.15	14.20	-43.09	41.76	-0.08	5.46	-17.20	16.98
74	66	-1.69	0.05	-1.78	-1.51	32.72	0.05	32.55	32.87	26.32	0.04	26.19	26.44	1.89	14.17	-42.01	40.64	-0.05	5.57	-16.02	18.03
143		-1.16	0.26	-1.68	-0.62	33.26	0.24	32.79	33.70	26.75	0.19	26.38	27.09								

Table 9: South-Central Barrow Strait, Microcat/ADCP statistical summary
Spring: March 21, 2008 – June 20, 2008

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	36	-1.74	0.04	-1.79	-1.55	32.65	0.11	32.45	32.88	26.27	0.09	26.10	26.46	2.49	12.52	-27.84	41.61	1.64	4.56	-12.17	21.00
	72													2.34	13.72	-32.86	40.42	2.00	5.13	-12.41	21.90
162	159	-1.31	0.11	-1.69	-0.87	33.22	0.09	32.88	33.60	26.72	0.07	26.45	27.02	1.90	11.66	-32.94	37.85	3.31	4.94	-12.65	22.46
262	223	-0.35	0.13	-1.08	-0.01	33.78	0.06	33.38	33.92	27.14	0.04	26.84	27.24	2.54	13.47	-31.10	47.65	7.56	6.40	-9.87	33.87

Table 10: South Barrow Strait, Microcat/ADCP statistical summary
Early Summer: June 21, 2008 – August 2, 2008

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
33	34	-1.61	0.12	-1.75	-0.89	32.52	0.10	31.89	32.69	26.16	0.08	25.63	26.30	12.65	17.91	-42.37	56.36	1.51	6.45	-24.52	21.68
61	62	-1.67	0.04	-1.76	-1.40	32.71	0.04	32.45	32.82	26.32	0.04	26.10	26.40	11.82	17.04	-42.92	52.89	1.10	6.00	-23.85	18.47
74	66	-1.65	0.04	-1.74	-1.52	32.75	0.04	32.59	32.87	26.35	0.04	26.21	26.45	11.62	16.94	-42.50	50.96	1.17	5.97	-19.95	18.06
143		-1.44	0.19	-1.76	-0.66	32.98	0.16	32.70	33.62	26.53	0.13	26.31	27.02								

Table 11: South-Central Barrow Strait, Microcat/ADCP statistical summary
Early Summer: June 21, 2008 – August 2, 2008

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	36	-1.67	0.04	-1.77	-1.48	32.62	0.10	32.24	32.83	26.24	0.08	25.94	26.41	4.87	15.68	-36.39	54.88	5.48	6.95	-15.46	30.45
	72													4.56	16.63	-36.63	53.43	4.93	6.38	-12.95	28.62
162	159	-1.39	0.13	-1.77	-0.95	33.11	0.11	32.75	33.48	26.63	0.09	26.35	26.92	3.56	13.04	-26.22	46.24	5.34	5.97	-17.40	26.61
262	223	-0.37	0.16	-1.02	-0.03	33.75	0.08	33.36	33.89	27.11	0.06	26.82	27.22	3.51	18.40	-38.20	54.65	11.39	8.37	-12.87	43.64

Table 12: South Barrow Strait, Microcat/ADCP statistical summary
Complete Record: August 1, 2007 – August 2, 2008

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
33	34	-1.49	0.54	-1.79	2.56	32.13	0.46	30.13	32.73	25.84	0.38	24.22	26.31	7.04	15.60	-42.37	72.00	0.14	5.27	-24.76	36.40
61	62	-1.51	0.25	-1.79	0.34	32.49	0.24	31.00	32.91	26.13	0.20	24.91	26.47	5.31	16.48	-50.05	63.63	0.34	5.53	-23.85	20.42
74	66	-1.51	0.18	-1.78	-0.57	32.62	0.17	31.47	33.18	26.24	0.14	25.30	26.69	5.03	16.55	-53.10	59.90	0.41	5.63	-19.95	19.17
143		-1.18	0.30	-1.76	-0.02	33.22	0.30	32.67	33.98	26.72	0.23	26.28	27.29								

Table 13: South-Central Barrow Strait, Microcat/ADCP statistical summary
Complete Record: August 2, 2007 – August 2, 2008

Depth (m)		Temperature (°C)				Salinity (ppt)				Density (Sigma-T)				Along-Strait Velocity (cm/s)				Cross-Strait Velocity (cm/s)			
Microcat	ADCP	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
40	36	-1.50	0.51	-1.79	2.33	32.31	0.47	30.56	32.93	25.99	0.39	24.57	26.49	3.69	14.34	-42.07	54.88	2.27	6.41	-25.79	35.57
	72													2.66	15.15	-46.08	53.43	2.33	6.56	-22.51	29.00
162	159	-1.26	0.19	-1.77	0.06	33.28	0.18	32.75	34.03	26.77	0.14	26.35	27.32	2.42	13.63	-33.87	50.79	4.88	5.94	-17.40	26.61
262	223	-0.36	0.22	-1.10	0.24	33.81	0.10	33.32	34.10	27.16	0.07	26.79	27.37	2.32	14.48	-38.20	54.65	8.88	6.75	-12.93	43.64

Table 14: ArcticNet Mooring, Microcat statistical summary Late Summer: August 4, 2007 – September 20, 2007

Depth (m)	Temperature (°C)				Salinity (ppt)				Density (Sigma-T)			
Microcat	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
42	-1.11	0.32	-1.59	0.77	32.47	0.18	31.71	32.96	26.11	0.15	25.43	26.51

Table 15: ArcticNet Mooring, Microcat statistical summary Fall: September 21, 2007 – December 20, 2007

Depth (m)	Temperature (°C)				Salinity (ppt)				Density (Sigma-T)			
Microcat	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
42	-1.06	0.42	-1.78	0.70	32.09	0.25	31.19	32.69	25.80	0.21	25.07	26.30

Table 16: ArcticNet Mooring, Microcat statistical summary Winter: December 21, 2007 – March 20, 2008

Depth (m)	Temperature (°C)				Salinity (ppt)				Density (Sigma-T)			
Microcat	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
42	-1.72	0.08	-1.80	-1.34	32.75	0.10	32.29	32.96	26.35	0.08	25.97	26.52

Table 17: ArcticNet Mooring, Microcat statistical summary Spring: March 21, 2008 – June 20, 2008

Depth (m)	Temperature (°C)				Salinity (ppt)				Density (Sigma-T)			
Microcat	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
42	-1.77	0.02	-1.80	-1.64	32.74	0.07	32.61	32.94	26.34	0.05	26.23	26.50

Table 18: ArcticNet Mooring, Microcat statistical summary Early Summer: June 21, 2008 – August 3, 2008

Depth (m)	Temperature (°C)				Salinity (ppt)				Density (Sigma-T)			
Microcat	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
42	-1.66	0.11	-1.77	-0.55	32.49	0.18	31.11	32.76	26.14	0.15	25.00	26.35

Table 19: ArcticNet Mooring, Microcat statistical summary Complete Record: August 4, 2007 – August 3, 2008

Depth (m)	Temperature (°C)				Salinity (ppt)				Density (Sigma-T)			
Microcat	Avg	SD	Min	Max	Avg	SD	Min	Max	Avg	SD	Min	Max
42	-1.48	0.40	-1.80	0.77	32.52	0.32	31.11	32.96	26.15	0.26	25.00	26.52

Table 20: Tidal Constants for K1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 1, 2007 – Oct. 17, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	7.65	2.05	168	354
14	7.53	1.95	167	351
18	7.18	2.17	165	350
22	6.98	2.41	162	349
26	6.71	2.31	159	346
30	6.64	2.21	159	345
34	6.89	2.06	157	344
38	6.97	2.16	157	342
42	6.98	2.11	157	341
46	7.11	1.94	156	336
50	7.19	1.92	156	334
54	7.23	1.95	157	332
58	7.26	1.95	156	332
62	7.37	2.01	156	332
66	7.69	1.80	154	334

For Solid Ice Period (Dec. 15, 2007 – Jul. 3, 2008):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	1.96	0.64	160	321
14	5.00	1.59	156	320
18	6.76	1.94	155	321
22	7.70	2.02	153	322
26	8.12	1.90	150	321
30	8.40	1.73	148	320
34	8.59	1.55	146	320
38	8.75	1.40	145	320
42	8.90	1.29	145	320
46	8.89	1.27	145	321
50	9.04	1.30	145	320
54	9.17	1.28	145	320
58	9.17	1.35	145	320
62	9.17	1.37	145	319
66	9.14	1.42	144	318

Table 20: Tidal Constants for K1 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	11.73	-0.27	161	355
16	12.04	-0.47	160	356
20	11.78	-0.89	159	355
24	11.33	-0.76	158	352
28	11.36	-0.75	158	350
32	11.06	-0.77	159	351
36	10.81	-0.42	157	351
40	Data affected by buoyancy package			
44				
48	12.14	0.05	159	0
52	11.93	0.14	158	0
56	11.68	0.19	158	0
60	11.67	0.21	159	1
64	11.79	0.16	158	2
68	11.94	0.06	158	3
72	12.08	-0.18	157	2

For Solid Ice Period (Jan. 19, 2008 – Jul. 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	9.28	-0.46	175	2
16	9.80	-0.58	172	1
20	10.25	-0.72	170	0
24	10.48	-0.93	167	358
28	10.59	-1.00	165	358
32	10.66	-1.17	163	356
36	10.81	-1.19	162	355
40	Data affected by buoyancy package			
44				
48	11.15	-1.31	160	354
52	11.20	-1.35	160	354
56	11.31	-1.43	160	354
60	11.41	-1.48	159	354
64	11.54	-1.46	159	354
68	11.66	-1.50	159	354
72	11.69	-1.59	159	354

Table 20: Tidal Constants for K1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	9.28	0.97	170	1
31	9.48	0.95	166	1
39	9.36	1.03	166	2
47	9.33	0.86	167	5
55	9.36	0.84	166	4
63	9.41	0.60	164	5
71	9.37	0.39	163	4
79	9.48	0.19	162	5
87	9.34	0.18	163	5
95	9.51	-0.01	163	5
103	9.48	-0.04	163	8
111	9.57	-0.02	161	10
119	9.97	0.09	162	11
127	10.46	0.03	162	12
135	11.16	0.38	162	12
143	11.55	0.37	164	12
151	12.23	0.19	165	12
159	12.54	0.10	166	12
167	12.93	0.16	165	12
175	13.16	0.48	165	13
183	13.29	0.30	166	13
191	13.39	0.07	164	13
199	13.26	-0.08	164	13
207	12.63	-0.13	162	13
215	12.58	-0.31	160	13
223	13.67	-0.92	159	13

Table 20: Tidal Constants for K1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Solid Ice Period (Jan. 19, 2008 – Jul. 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	8.11	0.39	175	355
31	8.41	0.01	171	355
39	8.28	-0.15	169	354
47	7.98	-0.23	167	354
55	7.97	-0.17	167	356
63	7.63	-0.20	166	356
71	7.47	-0.31	166	355
79	7.44	-0.26	166	356
87	7.22	-0.13	164	356
95	7.50	-0.14	162	357
103	7.52	-0.11	162	356
111	7.96	-0.19	162	356
119	8.37	-0.17	162	358
127	8.86	-0.45	161	358
135	9.53	-0.51	162	359
143	9.98	-0.74	162	0
151	10.46	-1.01	164	1
159	11.21	-1.22	164	2
167	11.56	-1.35	163	3
175	12.12	-1.40	163	4
183	12.75	-1.61	164	4
191	12.86	-1.83	165	4
199	12.80	-1.64	164	5
207	12.01	-1.53	163	5
215	11.62	-1.55	160	5
223	13.40	-2.28	159	4

Table 21: Tidal Constants for M2 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 1, 2007 – Oct. 17, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	8.91	-0.46	165	205
14	9.37	-0.59	162	204
18	9.58	-0.64	160	203
22	9.48	-0.71	159	202
26	9.07	-0.37	158	201
30	9.01	-0.35	160	202
34	9.29	-0.63	161	202
38	9.25	-0.74	160	200
42	9.08	-0.70	158	201
46	9.04	-0.52	158	201
50	8.90	-0.44	158	203
54	9.07	-0.40	159	204
58	9.17	-0.30	159	204
62	9.00	-0.34	161	204
66	8.88	-0.38	161	205

For Solid Ice Period (Dec. 15, 2007 – Jul. 3, 2008):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	1.30	0.74	153	179
14	2.75	1.89	173	199
18	3.76	2.29	175	203
22	4.40	2.41	175	205
26	5.03	2.14	175	208
30	5.65	1.61	175	210
34	6.48	0.87	174	211
38	7.40	-0.11	172	210
42	8.37	-1.10	171	209
46	9.35	-2.09	169	208
50	10.17	-2.94	167	206
54	10.75	-3.40	166	205
58	11.03	-3.62	164	203
62	11.10	-3.76	162	200
66	10.92	-3.71	161	198

Table 21: Tidal Constants for M2 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	8.64	-1.39	173	197
16	8.92	-1.60	174	197
20	9.00	-1.58	175	200
24	8.59	-1.32	174	201
28	8.36	-1.25	172	202
32	8.00	-1.18	171	203
36	8.07	-1.29	170	203
40	Data affected by buoyancy package			
44				
48	8.93	-1.64	173	204
52	8.83	-1.48	173	204
56	8.62	-1.34	173	204
60	8.35	-1.27	171	205
64	8.41	-1.30	170	204
68	8.53	-1.39	171	204
72	8.50	-1.31	171	204

For Solid Ice Period (Jan. 19, 2008 – Jul. 4, 2008):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	2.92	2.28	254	260
16	2.92	2.58	258	265
20	3.05	2.83	198	209
24	3.66	2.52	176	188
28	4.48	1.99	173	188
32	5.43	1.31	172	189
36	6.30	0.46	173	191
40	Data affected by buoyancy package			
44				
48	7.96	-1.41	174	195
52	8.38	-1.86	174	195
56	8.77	-2.21	175	195
60	9.13	-2.54	175	196
64	9.40	-2.73	174	197
68	9.45	-2.76	174	197
72	9.41	-2.80	174	197

Table 21: Tidal Constants for M2 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	7.43	-2.20	182	199
31	7.05	-1.96	182	201
39	6.91	-1.85	183	200
47	7.09	-1.85	183	199
55	7.07	-1.58	184	200
63	6.86	-1.23	184	199
71	6.69	-1.15	182	200
79	6.55	-1.14	180	201
87	6.36	-1.32	178	199
95	6.36	-1.40	175	199
103	6.11	-1.38	175	197
111	6.11	-1.68	173	201
119	6.50	-1.65	173	202
127	7.02	-1.53	172	204
135	7.65	-1.76	173	205
143	8.20	-2.05	176	206
151	8.51	-2.25	177	206
159	8.64	-2.31	178	207
167	8.75	-2.31	177	208
175	8.85	-2.17	176	209
183	9.20	-2.22	177	210
191	8.97	-2.21	180	210
199	8.66	-1.98	182	213
207	8.26	-2.03	184	215
215	7.79	-2.13	187	216
223	8.01	-2.43	189	218

Table 21: Tidal Constants for M2 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Solid Ice Period (Jan. 19, 2008 to Jul. 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	5.16	-0.47	182	194
31	5.91	-1.08	180	196
39	6.46	-1.66	182	195
47	6.90	-2.14	181	196
55	6.91	-2.26	180	196
63	6.89	-2.43	180	197
71	6.85	-2.48	181	195
79	6.75	-2.46	180	195
87	6.45	-2.47	180	193
95	6.58	-2.51	178	195
103	6.50	-2.48	177	195
111	6.82	-2.54	177	194
119	7.04	-2.47	177	195
127	7.10	-2.44	176	195
135	7.17	-2.31	178	193
143	7.19	-2.24	175	193
151	7.18	-1.96	171	193
159	7.20	-1.75	171	190
167	7.22	-1.64	171	187
175	7.40	-1.34	168	187
183	7.57	-1.40	167	187
191	7.69	-1.62	171	187
199	7.78	-1.76	173	188
207	7.58	-1.73	176	189
215	7.23	-1.95	181	192
223	7.79	-2.15	185	195

Table 22: Tidal Constants for O1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 1, 2007 to Oct. 17, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	3.50	1.15	177	307
14	3.51	1.22	177	311
18	3.54	1.19	176	310
22	3.48	1.24	172	304
26	3.36	1.40	170	300
30	3.08	1.45	159	288
34	3.11	1.38	149	278
38	3.22	1.53	144	270
42	3.16	1.59	145	271
46	3.11	1.59	146	270
50	3.12	1.70	146	266
54	3.21	1.74	146	266
58	3.36	1.67	142	265
62	3.53	1.34	144	267
66	3.73	1.16	144	266

For Solid Ice Period (Dec. 15, 2007 – Jul. 3, 2008):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	0.85	0.31	150	247
14	2.24	0.55	152	259
18	3.09	0.62	154	264
22	3.48	0.71	153	265
26	3.68	0.70	152	267
30	3.79	0.77	152	268
34	3.82	0.74	150	270
38	3.86	0.71	151	271
42	3.93	0.63	149	272
46	3.94	0.58	148	270
50	4.00	0.59	146	268
54	4.04	0.58	145	267
58	4.09	0.54	144	265
62	4.13	0.49	143	263
66	4.12	0.52	141	261

Table 22: Tidal Constants for O1 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	6.01	0.43	170	311
16	5.79	0.26	169	306
20	5.47	0.34	169	303
24	5.57	0.43	166	303
28	5.69	0.63	164	301
32	5.54	0.60	164	303
36	5.41	0.60	164	304
40	Data affected by buoyancy package			
44				
48	5.96	1.10	164	307
52	5.94	0.94	165	308
56	5.85	0.68	165	307
60	5.65	0.54	164	308
64	5.70	0.37	164	309
68	5.79	0.38	164	310
72	5.92	0.25	164	311

For Solid Ice Period (Jan. 19, 2008 – Jul. 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	4.09	0.17	175	309
16	4.64	0.03	173	308
20	5.15	-0.20	170	305
24	5.44	-0.39	167	303
28	5.56	-0.54	164	302
32	5.58	-0.64	164	300
36	5.60	-0.67	163	299
40	Data affected by buoyancy package			
44				
48	5.66	-0.48	161	299
52	5.72	-0.47	161	300
56	5.66	-0.45	160	300
60	5.67	-0.41	160	300
64	5.61	-0.39	160	300
68	5.65	-0.37	160	300
72	5.60	-0.42	159	299

Table 22: Tidal Constants for O1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	4.77	1.22	175	304
31	4.82	0.96	174	306
39	4.61	0.91	171	308
47	4.60	0.73	172	307
55	4.58	0.50	171	308
63	4.51	0.42	172	311
71	4.50	0.33	171	312
79	4.53	0.28	170	311
87	4.46	0.23	169	310
95	4.47	0.16	167	310
103	4.09	0.32	167	311
111	4.21	0.29	168	313
119	4.36	0.41	167	314
127	4.64	0.53	166	317
135	5.00	0.59	168	319
143	5.17	0.47	167	320
151	5.40	0.76	168	319
159	5.57	0.78	169	319
167	5.74	0.91	170	320
175	5.97	0.93	171	320
183	5.91	0.88	172	320
191	5.90	0.85	170	317
199	5.87	0.95	169	315
207	5.91	0.74	168	313
215	5.95	0.62	167	312
223	6.42	0.44	163	310

Table 22: Tidal Constants for O1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Solid Ice Period: (Jan. 19, 2008 – Jul. 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	4.30	0.30	168	301
31	4.61	0.45	167	302
39	4.34	0.48	164	302
47	4.12	0.30	166	302
55	3.93	0.39	164	301
63	3.77	0.33	165	301
71	3.64	0.29	165	301
79	3.71	0.28	165	300
87	3.52	0.25	163	300
95	3.56	0.19	161	297
103	3.66	0.28	162	299
111	3.78	0.29	163	299
119	4.03	0.25	161	301
127	4.31	0.36	161	302
135	4.54	0.21	161	304
143	4.66	0.37	165	304
151	4.80	0.36	163	304
159	5.13	0.28	163	307
167	5.37	0.25	164	309
175	5.66	0.22	166	311
183	6.19	0.21	168	311
191	6.38	0.31	168	311
199	6.25	0.42	168	311
207	5.72	0.65	167	311
215	5.53	0.65	162	308
223	6.27	0.55	161	307

Table 23: Tidal Constants for P1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 1, 2007 – Oct. 17, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	2.33	1.12	166	315
14	2.55	0.98	165	312
18	2.30	0.91	141	296
22	2.13	0.80	120	279
26	2.13	0.79	117	275
30	1.81	1.03	119	280
34	1.37	1.06	133	298
38	1.43	1.08	139	310
42	1.31	0.88	156	322
46	1.55	0.65	155	303
50	1.86	0.46	146	294
54	1.96	0.30	139	290
58	1.83	0.16	140	286
62	1.46	0.18	139	286
66	0.77	0.12	142	305

For Solid Ice Period (Dec. 15, 2007 – Jul. 3, 2008):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	1.28	0.69	171	313
14	2.07	0.63	172	335
18	2.56	0.44	169	337
22	2.91	0.29	165	338
26	3.23	0.28	164	339
30	3.45	0.19	164	340
34	3.45	0.12	161	339
38	3.47	0.08	159	338
42	3.36	-0.05	157	340
46	3.27	-0.10	157	342
50	3.34	-0.05	157	341
54	3.38	-0.06	157	340
58	3.33	0.02	158	339
62	3.20	0.07	158	338
66	3.16	0.02	156	335

Table 23: Tidal Constants for P1 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	4.93	-0.51	151	339
16	4.82	-0.75	152	341
20	4.88	-1.14	154	339
24	5.46	-1.35	156	331
28	6.17	-0.97	158	329
32	6.01	-0.72	159	326
36	5.84	-0.79	155	325
40	Data affected by buoyancy package			
44				
48	4.67	-0.20	145	342
52	4.65	-0.22	146	342
56	4.74	-0.32	148	338
60	4.36	-0.06	147	337
64	4.02	-0.14	145	339
68	3.95	-0.22	146	341
72	4.23	-0.43	148	343

For Solid Ice Period (Jan. 19, 2008 – July 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	3.20	-0.37	184	345
16	3.40	-0.39	177	350
20	3.60	-0.40	174	354
24	3.74	-0.32	169	355
28	3.80	-0.30	167	356
32	3.79	-0.36	164	355
36	3.76	-0.50	163	353
40	Data affected by buoyancy package			
44				
48	3.60	-0.50	161	352
52	3.76	-0.57	159	354
56	3.84	-0.59	159	354
60	3.84	-0.67	160	352
64	3.87	-0.61	159	351
68	3.82	-0.63	159	352
72	3.84	-0.66	159	352

Table 23: Tidal Constants for P1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	2.73	0.85	171	349
31	3.07	0.42	161	343
39	3.10	0.53	159	346
47	2.84	0.69	162	354
55	2.82	0.55	162	0
63	3.10	0.30	158	3
71	3.10	0.23	158	2
79	3.26	-0.01	158	4
87	3.20	0.04	160	6
95	3.11	-0.13	159	10
103	3.05	-0.14	160	15
111	3.13	-0.01	162	19
119	3.11	0.27	165	18
127	3.12	0.33	166	16
135	3.32	0.54	161	12
143	3.71	0.78	164	6
151	4.03	0.65	164	4
159	4.13	0.68	167	4
167	4.36	1.07	164	3
175	4.22	1.48	157	358
183	4.12	1.40	151	354
191	3.97	1.30	146	350
199	3.95	1.32	141	345
207	3.92	1.15	140	344
215	3.77	1.22	141	348
223	4.05	1.02	146	351

Table 23: Tidal Constants for P1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Solid Ice Period: (Jan. 19, 2008 – Jul. 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	2.17	0.07	181	321
31	2.34	-0.04	173	328
39	2.29	-0.18	168	325
47	2.22	-0.33	165	320
55	2.33	-0.38	166	316
63	2.51	-0.43	168	309
71	2.49	-0.30	167	305
79	2.57	-0.34	168	305
87	2.81	-0.28	169	307
95	2.88	-0.34	166	310
103	2.89	-0.34	164	310
111	3.02	-0.39	165	313
119	2.92	-0.24	163	315
127	2.96	-0.26	161	318
135	2.84	-0.28	161	321
143	2.98	-0.30	161	322
151	3.16	-0.12	166	326
159	3.13	-0.05	170	335
167	3.14	-0.05	169	341
175	3.24	0.13	167	344
183	3.43	0.07	165	343
191	3.28	0.13	162	341
199	3.26	0.30	161	339
207	3.19	0.24	156	333
215	3.19	0.28	153	334
223	3.84	0.29	159	344

Table 24: Tidal Constants for S2 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 1, 2007 – Oct. 17, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	4.04	0.02	170	256
14	4.18	0.21	164	251
18	4.26	0.13	159	248
22	4.20	-0.11	159	250
26	4.32	-0.38	159	251
30	4.51	-0.49	160	250
34	4.58	-0.55	159	248
38	4.67	-0.60	158	245
42	4.66	-0.65	159	245
46	4.71	-0.78	159	245
50	4.77	-0.70	159	246
54	4.62	-0.52	160	248
58	4.42	-0.35	159	250
62	4.44	-0.16	158	251
66	4.40	0.01	157	250

For Solid Ice Period (Dec. 15, 2007 – Jul. 3, 2008):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
10	0.60	0.11	159	259
14	1.03	0.60	176	251
18	1.55	0.65	170	244
22	1.80	0.67	166	242
26	2.11	0.59	165	240
30	2.36	0.51	162	239
34	2.60	0.30	160	240
38	2.90	0.11	158	240
42	3.10	-0.16	159	240
46	3.41	-0.42	160	243
50	3.64	-0.70	163	245
54	3.76	-0.83	165	247
58	3.76	-0.97	165	250
62	3.77	-1.09	166	250
66	3.78	-1.11	166	250

Table 24: Tidal Constants for S2 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	5.59	-1.21	188	256
16	5.52	-1.48	187	258
20	5.80	-1.93	184	258
24	5.85	-1.94	183	255
28	5.76	-1.59	183	250
32	5.57	-1.45	182	247
36	5.57	-1.54	179	243
40 44	Data affected by buoyancy package			
48	5.29	-1.63	170	243
52	5.16	-1.50	169	241
56	5.07	-1.33	169	240
60	5.02	-1.31	168	241
64	4.96	-1.12	166	242
68	4.72	-0.96	166	241
72	4.45	-0.72	167	241

For Solid Ice Period (Jan. 19, 2008 – Jul. 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
12	1.22	0.65	251	303
16	1.30	0.80	250	307
20	1.30	1.05	256	313
24	1.50	1.14	166	224
28	2.00	0.94	169	226
32	2.43	0.68	169	225
36	2.71	0.32	168	225
40 44	Data affected by buoyancy package			
48	3.46	-0.58	175	236
52	3.53	-0.72	177	237
56	3.60	-0.88	178	240
60	3.58	-0.85	179	242
64	3.59	-0.74	182	243
68	3.66	-0.71	183	244
72	3.71	-0.85	184	246

Table 24: Tidal Constants for S2 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 2, 2007 – Oct. 20, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	5.10	-1.65	170	253
31	5.01	-1.39	172	248
39	4.76	-1.30	171	244
47	4.56	-1.05	166	243
55	4.06	-0.72	164	243
63	3.85	-0.77	166	244
71	3.71	-0.77	168	243
79	3.72	-0.48	168	242
87	3.51	-0.61	169	243
95	3.61	-0.59	166	246
103	3.49	-0.51	167	245
111	3.60	-0.41	162	248
119	3.76	-0.93	162	251
127	3.80	-0.76	164	252
135	3.83	-0.78	167	251
143	3.58	-0.68	170	251
151	3.21	-0.36	168	252
159	2.86	-0.07	169	251
167	2.68	0.14	169	254
175	2.15	0.28	172	253
183	2.11	0.41	170	253
191	1.89	0.53	164	242
199	2.05	0.53	160	237
207	2.10	0.37	155	237
215	2.00	0.16	162	240
223	2.40	-0.15	167	242

Table 24: Tidal Constants for S2 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Solid Ice Period: (Jan 19, 2008 – Jul. 4, 2008)

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
23	2.06	-0.04	180	238
31	2.49	-0.38	180	238
39	2.77	-0.68	181	241
47	2.84	-0.83	185	241
55	2.95	-1.06	183	244
63	2.96	-1.11	189	240
71	2.94	-1.14	189	242
79	2.98	-1.31	187	246
87	2.89	-1.50	188	247
95	2.93	-1.30	189	245
103	2.91	-1.34	187	250
111	3.12	-1.34	183	254
119	3.09	-1.27	182	250
127	3.14	-1.24	182	248
135	3.08	-1.00	182	245
143	3.02	-0.82	179	243
151	3.08	-0.75	175	240
159	3.44	-0.85	175	234
167	3.29	-1.10	175	228
175	3.23	-1.14	173	229
183	3.15	-1.05	176	229
191	3.23	-0.99	174	231
199	3.16	-0.94	174	234
207	2.89	-0.77	179	232
215	2.67	-0.79	180	234
223	2.86	-0.73	183	229