MOORED INSTRUMENT AND CTD OBSERVATIONS FROM BARROW STRAIT, 2006-2007

R. Pettipas and J. Hamilton

Ocean and Ecosystem Sciences Division
Maritimes Region
Fisheries and Oceans Canada

Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
Canada B2Y 4A2

2013

Canadian Data Report of Hydrography and Ocean Sciences 192

Canadian Data Report of Hydrography and Ocean Sciences

Data reports provide a medium for the documentation and dissemination of data in a form directly useable by the scientific and engineering communities. Generally, the reports will contain raw and/or analyzed data but will not contain interpretations of the data. Such compilations will commonly have been prepared in support of work related to the programs and interests of the Oceans and Science sectors of Fisheries and Oceans Canada.

The correct citation for data reports appears above the abstract of each report. Each report is abstracted in the data base *Aquatic Sciences and Fisheries Abstracts*.

Data reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page.

Regional and headquarters establishments of the form Ocean Science and Surveys sector ceased publication of their various report series in December 1981. A complete listing of these publications and the last number issued under each title are published in the *Canadian Journal of Fisheries and Aquatic Sciences*, Volume 38: Index to Publications 1981. The current series began with Report Number 1 in January 1982.

Rapport statistique canadien sur l'hydrographie et les sciences océaniques

Les rapports statistiques servent de véhicule pour la compilation et la diffusion des données sous une forme directement utilisable par les scientifiques et les ingénieurs. En général, les rapports contiennent des données brutes ou analysées mais ne fournissent pas d'interprétations des données. Ces compilations sont préparées le plus souvent à l'appui de travaux reliés aux programmes et intérêts des secteurs des Océans et des Sciences de Pêches et Océans Canada.

Le titre exact des rapports statistiques figure au-dessus du résumé de chaque rapport. Les rapports statistiques sont résumés dans la base de données *Résumés des sciences aquatiques et halieutiques*.

Les rapports statistiques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapport seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page de titre.

Les établissements de l'ancien secteur des Sciences et Levés océaniques dans les régions et à l'administration centrale ont cessé de publier leurs diverses séries de rapports en décembre 1981. Vous trouverez dans l'index des publications du volume 38 du *Journal canadien des sciences halieutiques et aquatiques*, la liste de ces publications ainsi que le dernier numéro paru dans chaque catégorie. La nouvelle série a commencé avec la publication du rapport numéro 1 en janvier 1982.

Canadian Data Report of
Hydrography and Ocean Sciences 192

2013

MOORED INSTRUMENT AND CTD OBSERVATIONS FROM BARROW STRAIT, 2006-2007

by

Roger Pettipas and Jim Hamilton

Ocean and Ecosystem Sciences Division,
Fisheries and Oceans Canada
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
Canada, B2Y 4A2

Cat. No. Fs 97-16/192E ISSN 0711-6721

Correct Citation for this publication:

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

Table of Contents

List of Figures

List of Tables

Abstract

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

Instrumented moorings deployed in the eastern end of Barrow Strait from August 2006 to August 2007 provide yearlong records of current, temperature, salinity, ice drift and ice thickness, 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, and ice draft from an ice profiling sonar (IPS) are also presented. The current and CTD data are presented as filtered and unfiltered time series, spectral and tidal analyses products, and statistical summaries.

Finally, two CTD sections across Barrow Strait and one section across Wellington Channel, obtained from an August 2007 ship-based survey, are also presented.

Résumé

Pettipas, R. and J. Hamilton. 2013. Observations des instruments amarrés et des sondes CTP dans le détroit de Barrow, 2006-2007. Can. Data Rep. Hydrogr. Ocean Sci. 192: viii + 98 p.

Les amarrages équipés installés à l'extrémité est du détroit de Barrow d'août 2006 à août 2007 ont fourni des enregistrements tout au long de l'année du courant, de la température, de la salinité, de la dérive et l'épaisseur 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 le tirant d'eau glaciel d'un sonar profileur de glace, 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.

Finalement, deux sections de CTP dans le détroit de Barrow et une section dans le détroit de Wellington, obtenues à partir d'un relevé par navire effectué en août 2007, sont aussi présentées.

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 8 years of this study, along with a description of the methods used, have previously been reported [Pettipas et al., 2010, 2008, 2006, 2005; Hamilton et al., 2008, 2004, 2003, 2002]. Described here are moored instrument data from the ninth 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 also 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. Ice draft measurements were acquired with a moored ASL ice profiling sonar (IPS), and a statistical summary of these data is presented graphically and in tables. This is the third year for ice draft measurements. They were also collected at the same location in 2003-2004 [Hamilton et al., 2008] and 2005-2006 [Pettipas et al., 2010]. The moored profiler Icycler described in Fowler et al. [2004], was scheduled for recovery with the other instruments reported on here, but this mooring broke between the Icycler and CTD just below it on Dec 6 (determined from the CTD record) and only the bottom of the mooring was recovered.

Finally, hydrographic sections at the eastern and western ends of Barrow Strait and a section across Wellington Channel are presented. These cross-sectional diagrams are created from a CTD survey conducted during the field study. These CTD lines have been completed each summer since 1998 when ice conditions allowed.

Mooring Locations and Description

Instrumented moorings were located at 2 sites on the South side of Barrow Strait (Figure 1), dropping the Central and Northern sites also occupied in the previous 5 years. While this action was required to reduce program costs, it still allows for estimation of the volume, freshwater and heat transports through the strait since analysis of the data from those previous years indicated that transports are almost entirely confined to the southern half of the strait. Two moorings were located at the 150 m contour (the South site), and 3 moorings were located at the "South-Central" site which is halfway between the South site and the center of the strait. An illustration of the 5 moorings that were deployed is shown in Figure 2.

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 over the yearlong deployments. 307 kHz Workhorse Sentinel ADCPs were used at both the South and South-Central sites for sampling over the top 70 to 80 m. At the South-Central site a "Long Ranger ADCP" (75 kHz) was also used, to measure currents over the entire water column (~ 266m). 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. However, there were issues with the Long Ranger record due to a combination of changing instrument inclination over the course of the deployment due to the slow flooding of one of the buoyancy elements supporting the instrument, and a manufacturer's firmware bug that prevented the tilt compensation routine from properly correcting the current measurements for that tilt.

An Ice Profiling Sonar (IPS) was moored at the South-Central site, and provided good quality ice draft data for the duration of the yearlong deployment. Ice draft is the distance between the bottom of the ice and mean sea level.

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 near-bottom at the South-Central site, and one was located just under the Icycler. These CTDs recorded temperature, conductivity and pressure at a single depth every 30 minutes. All 8 Microcat CTDs were recovered and returned good data.

A summary of the 2006-2007 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. Typically, the highest useful depth average in the data sets from the 2 upper (~80 m) 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 100% or near-100% ice cover.

A 307 kHz WHADCP was moored at both the South and South-Central sites at depths of 85 and 73 m respectively to provide currents over the upper water column. At the South-Central site where the bottom depth is 266 m, the 75 kHz Long Ranger ADCP (LRADCP) moored near bottom (253 m) provided near full water column coverage, overlapping the range of the 307 kHz unit in the top 70 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, exceeding 3 meters only 0.4% of the time.

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; exceeding 3 m less than 0.5% of the time.

Low-Pass Filtering

Where low-pass filtered data are reported, filtering to remove the semidiurnal and diurnal tides using the technique described by Godin [1972] has been applied. 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 apply 48, 48 and 50 sample averaging filters.

Tidal Analysis

Harmonic tidal analyses of current data using the method described by Foreman [1978] 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 5 to Nov 2, 2006 (13 weeks) while the consolidated, landfast ice period was March 3 to June 12, 2007 (14 weeks). At the South-Central site, the ice was landfast for only a 2 week period in March, which is too short a period for the tidal analysis. The ice free period at the South-Central site (Aug 5 to Nov 4, 2006) was nearly identical to that at the South site. 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 and 4. At both the South and South-Central sites, the expected freshening due to summer melting doesn't appear in the CTD records until late-October which for the South site is 6 weeks later than observed in 2005-2006. The freshening is also of shorter duration at the South site; just 1 month compared to over 4 months in the previous year, but a decrease of 1 to 1.5 psu is seen at both the 40 and 80 m levels while in 2005-2006 freshening was only evident at the 40 m level.

Power spectra of the moored CTD measurements are shown in Figures 5 and 6. Diurnal and weaker semi-diurnal signals are typically observed in the records.

Current data are reported next. A data quality issue with the LRADCP measurements from the South-Central site is outlined in Figures 7 and 8. The LRADCP was mounted in a streamlined buoyancy and frame arrangement that aligns itself with the

flow. Over the duration of the deployment, one of the buoyancy elements developed a slow leak that altered the pitch of the assembly in the stepwise fashion illustrated in Figure 7. Although the instrument is supposed to correct current measurements for inclination from vertical, a bug in the manufacturer's firmware prevented this from occurring. The impact is shown in Figure 8 where vector mean velocities from the LRADCP are compared with those from the WHADCP moored 400 m away, over the depth range where the measurements overlap. Over the first 4 months, before there was sufficient buoyancy change to cause a significant pitch, the difference in vector mean rates/directions are about 1 cm/s, and 20° respectively. With each of the 2 step-changes in pitch after that, there is an associated impact on the reported current from the LRADCP, with under-reading of speed that is caused by higher instrument pitch. The pitch also negatively impacts the reported direction. As there is no simple methodology to correct the LRADCP measurements for this issue, no correction has been applied in the LRADCP data presented in this report.

Yearlong progressive vector diagrams for each ADCP are shown in Figures 9-11. An eastward alongstrait flow predominates in the upper water column at both the South (Fig 9) and South-Central (Fig 11) sites. The LRADCP indicates a predominantly northward flow in the lower water column (Fig 10), which was also observed at this site in previous years. Note though that there is a misreporting of the magnitude of this northerly component after early December when uncorrected instrument tilt biases the reported current direction towards the north at all levels.

A month of bi-hourly current data are presented as along-strait and cross-strait components for each ADCP in Figures 12-14, where positive values are defined as flow towards 105° true and 15° true, respectively. These figures reveal the strong tidal nature of the flow. Note that in deep water at the South-Central site the along-strait component of the tidally dominated flow is stronger than the cross-strait component even with the uncorrected northward bias. Yearlong records of low-pass filtered data (tides removed) for the 3 instruments are shown in Figures 15-17. Mean flow is predominantly eastward at both sites in the upper water column, but more northerly in deep water at the South-Central site (keeping in mind the northward component is over-estimated due to instrument bias; see Fig 8).

Smoothed temperature, salinity and current data (where available) are shown for each moored CTD level in Figures 18-25. The CTD record from the 62 m level at the South site ends in December when the Icycler profiler above this CTD broke free, causing the CTD to fall to the bottom and remain there until mooring recovery. Tables 2 through 13 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. South-Central site velocities reported in the tables are from the WHADCP for the 35 m depth, and the LRADCP for the deeper levels.

Annual and seasonal mean flows are summarised in Figures 26-31. Each 4 m binned value for the 307 kHz ADCPs (8 m for the 75 kHz ADCP) is shown except for data from the bin centered at 39 m depth at the South-Central site, which are not reported because of acoustic contamination at this level created by the buoyancy package at the top of the mooring. Annual and late summer mean currents in the upper water column at the South site are the lowest observed since the 98-99 deployment (the first year of the program), but currents in all seasons at the South-Central site are fairly typical of what has been observed in past years. A unique feature in the 06-07 current data is that the winter and spring seasonal means for the South-Central site are nearly twice those observed at the South site. In the 5 previous years, the South site winter and spring means were nearly always larger than the South-Central site values.

The variance in the bi-hourly, and low-pass filtered current data for the yearlong ADCP records are shown in Figure 32. 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 33 – 47. Separate analyses have been done for open water and immobile ice-covered periods at the South site, but only for the ice-free period at the South-Central site because the period of immobile solid ice cover there was too short for reliable analysis . K1 and M2 constituents are similar in magnitude. At the South site results for the immobile ice period show diminishing M2 amplitudes near surface, due to frictional affects caused by the ice. Ellipse orientations are along-strait as expected. Tidal constants are summarised in Tables 14 - 18.

Ice velocities through the year at both sites were derived from the WHADCPs, and are shown in Figures 48 and 49. Since the ice drift measurement quality is degraded by the presence of open water, there are periods in the time series when 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.

Ice was landfast at the South site from the first of February until early June, and for several 1-2 week periods before that. At the South-Central site there was only a single 2 week period when the ice was immobile. Comparing to results in previous years, it is clear that there is significant inter-annual variability in this ice cover feature.

Ice draft was measured at the South-Central site for the third time in this program, the first year being 2003-2004 and then again in 2005-2006. Monthly mean, standard deviation, and maximum ice draft for 2006-2007 are shown in Figure 50 and Table 19, while histograms of draft distribution by month (based on the data presented in Table 20), are shown in Figure 51. Mean ice draft quickly grew from early October to a maximum mean draft of 1.7 m in December and then linearly decreased to 0.1 m in May. This is in contrast to 05-06 and 03-04 when mean ice drafts were more than 1 m until May. Monthly maximum ice drafts were 6 to 18 m between December and May in 06-07 suggesting rafting of the mobile ice pack. Ice remained mobile all winter in 03-04 as well and monthly maximum drafts then, from December through to June were also large (12 to 22 m), but in that year the rafting appeared to build ice volume as well so that larger monthly mean drafts (1.2 to 2.2 m) were recorded from December through to May. In 05-06 when ice was immobile from January to early July the mean draft was fairly constant (0.8 to 1.3 m) but monthly maximum values were low (~ 2 m).

A station map for the August 2007 ship-based CTD survey is shown in Figure 52. Results in the form of contour plots are shown in Figures 53 – 55, and indicate an eastward geostrophic flow along the southern half of Barrow Strait and a weaker westward flow confined near the coast in the upper 100 m on the North side. There is a southward geostrophic flow over the western half of Wellington Channel. CTD details and statistics are presented in Table 21.

Acknowledgements

We thank Simon Higginson and Adam Drozdowski for their reviews of this report.

This work is funded by the Canadian Department of Fisheries and Oceans and the Panel on Energy Research and Development (PERD, Natural Resources Canada).

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 Magnetic Poles, in *Proceedings of the Eleventh (2001) International Offshore and Polar Engineering Conference*, 656-660. ISOPE: Stavanger, Norway.

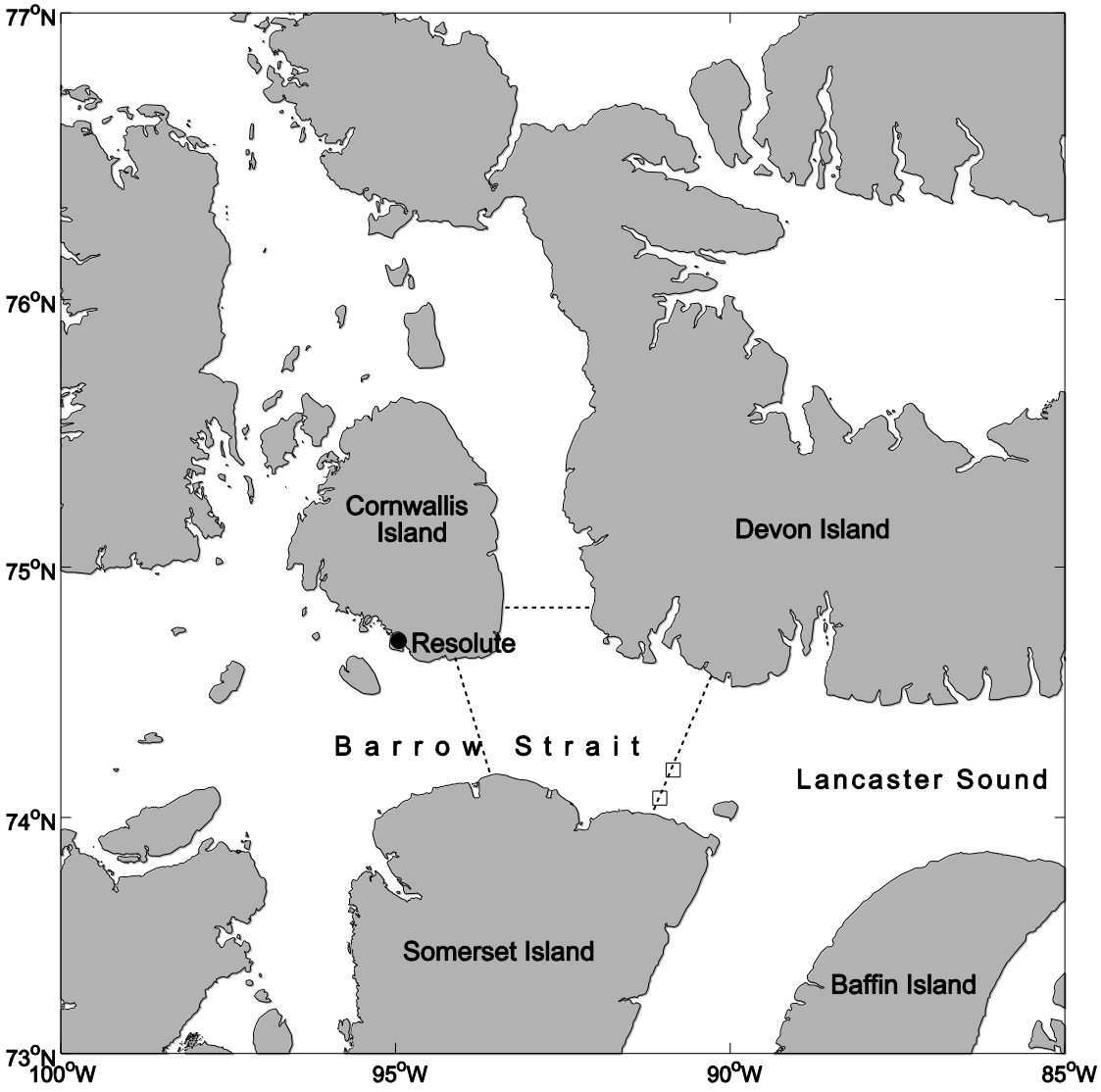
Pettipas, R., J. Hamilton, and S. Prinsenberg. 2010. Moored instrument observations from Barrow Strait, 2005-2006. Can. Data Rep. Hydrogr. Ocean Sci. 190 : vii + 139 p.

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 (the open boxes), and the hydrographic survey lines (the dashed lines).



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

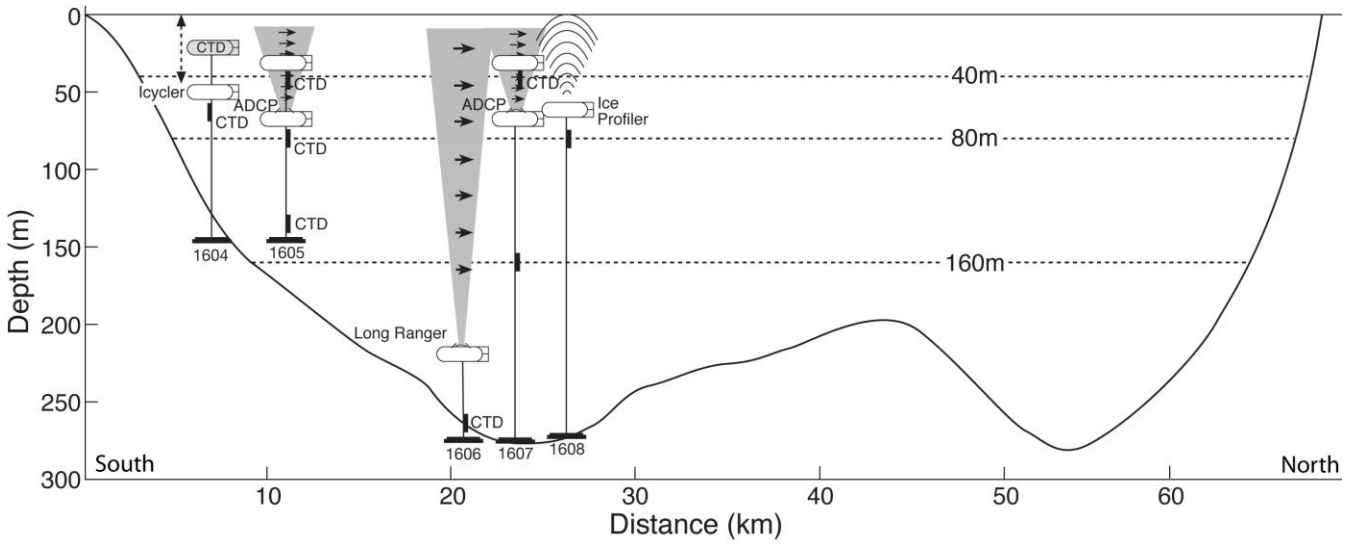


Figure 3: Moored 30 min. CTD data, South Side Barrow Strait. August 2006 – July 2007

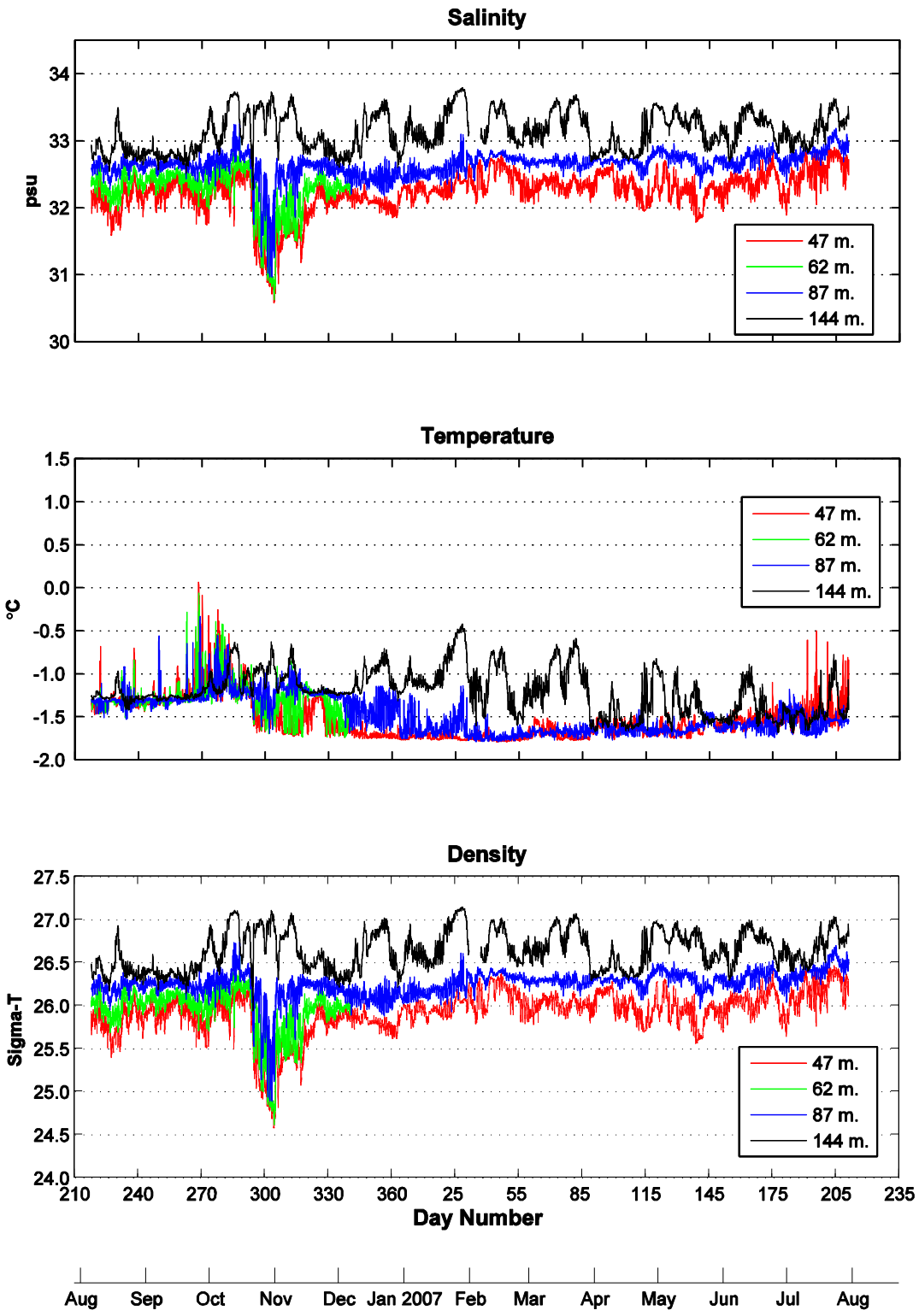


Figure 4: Moored 30 min. CTD data, South-Central Barrow Strait. August 2006 – July 2007

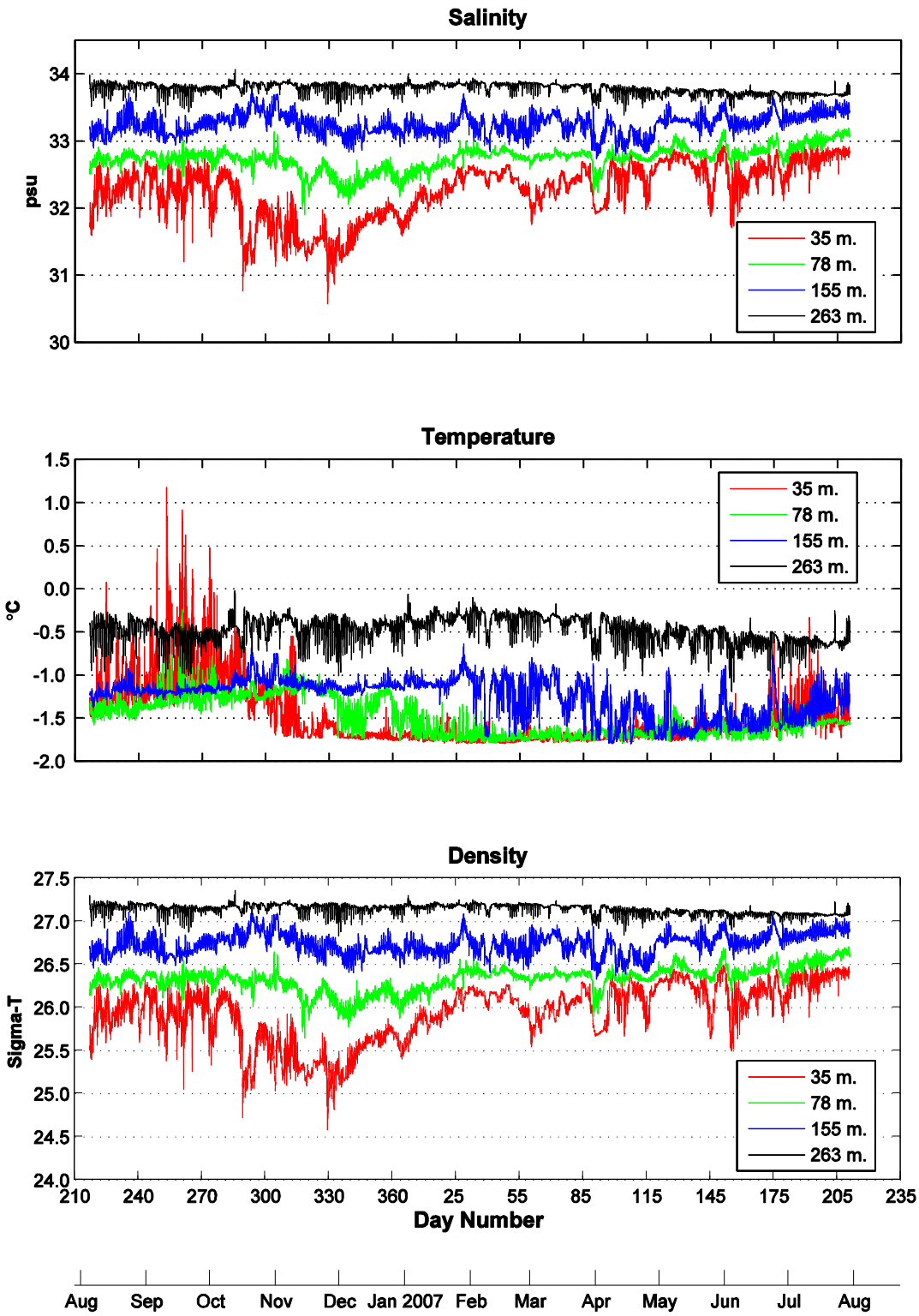


Figure 5: Power Spectra of moored bi-hourly CTD data. South Side Barrow Strait: Aug. 2006 – July 2007.

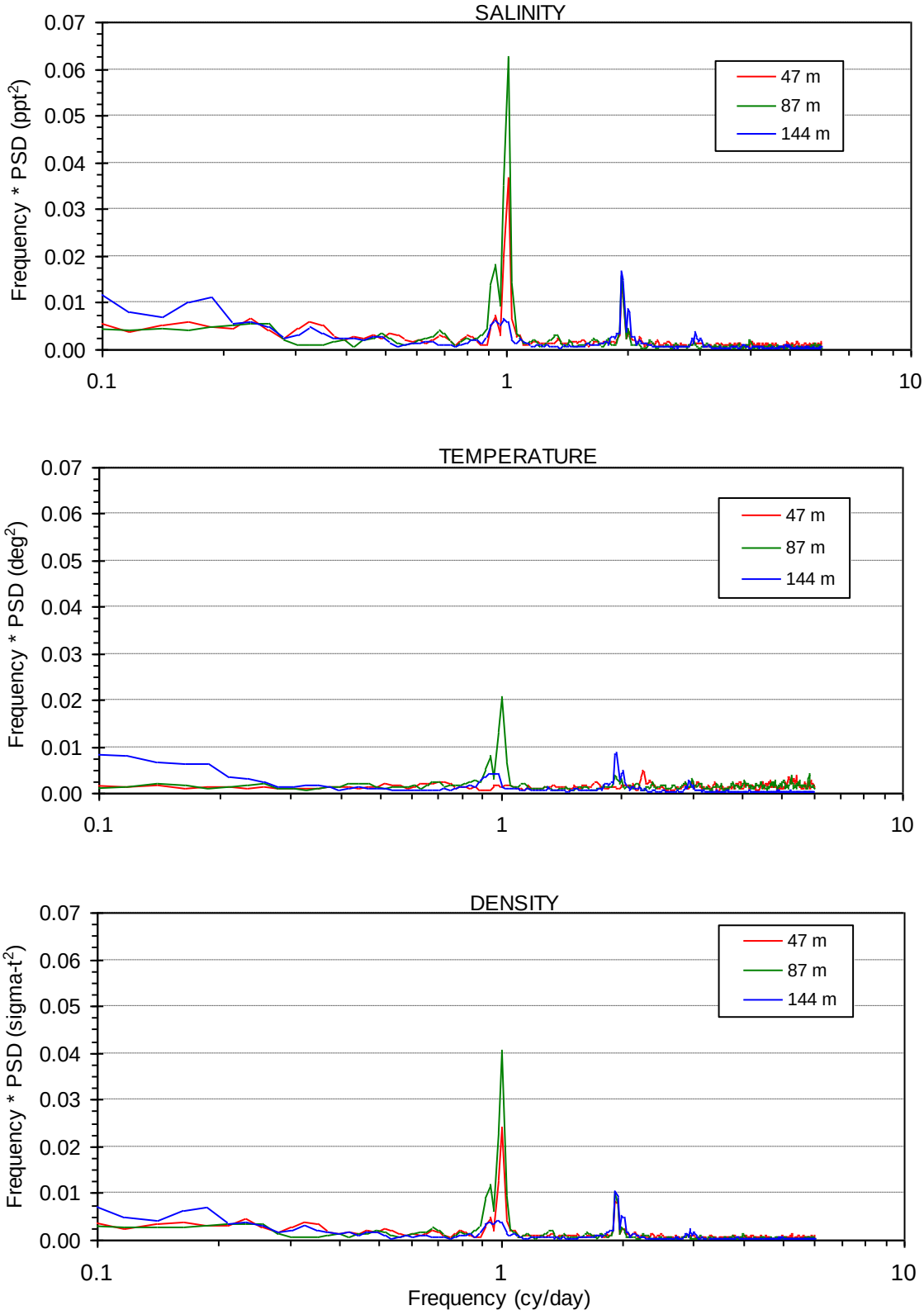


Figure 6: Power Spectra of moored bi-hourly CTD data. South-Central Barrow Strait: Aug. 2006 – July 2007.

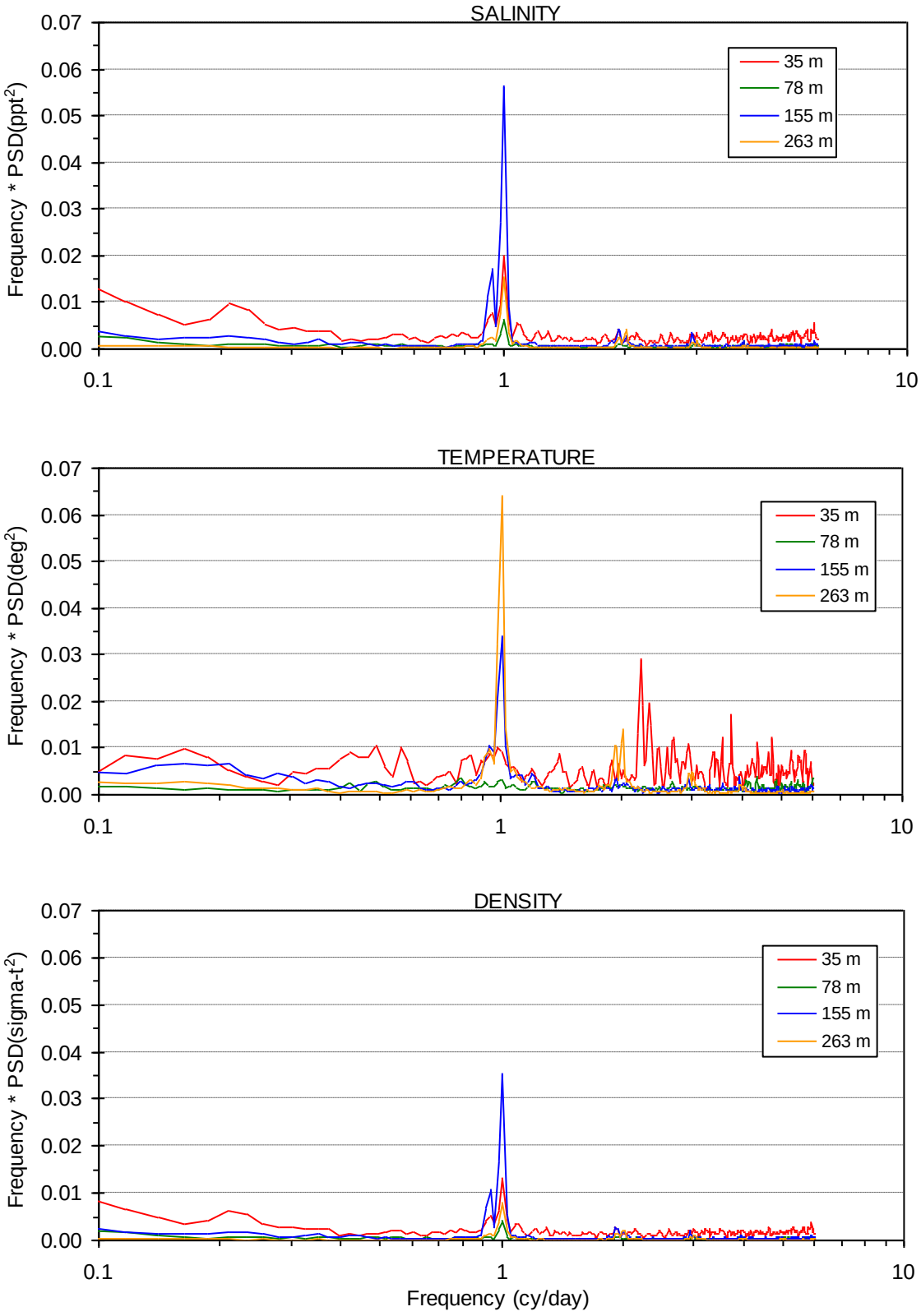
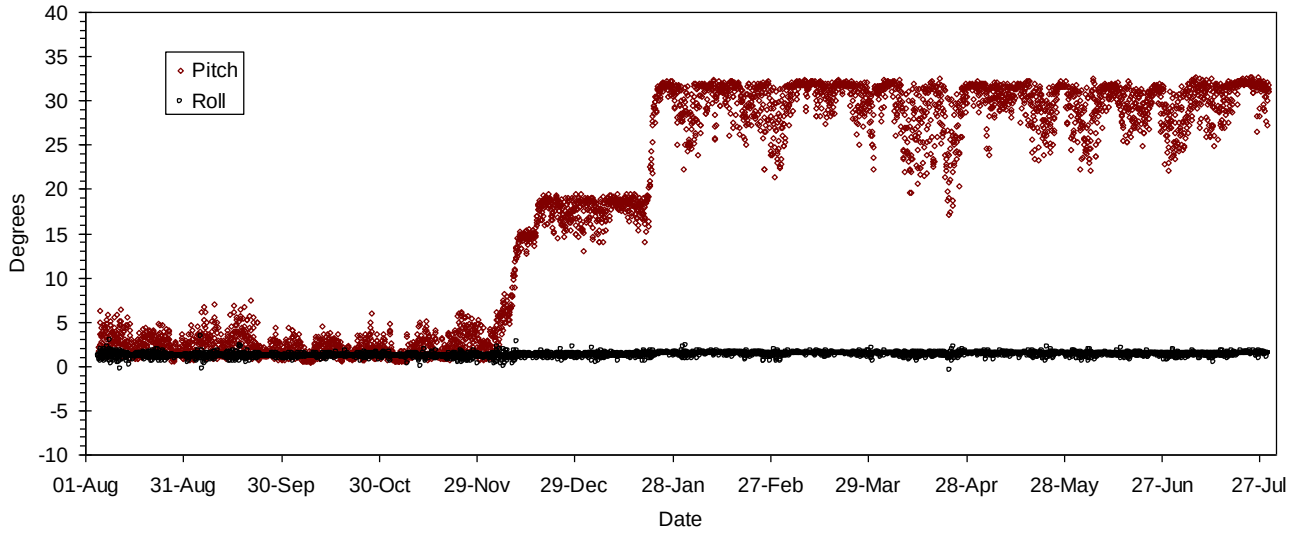


Figure 7: Inclination of the buoyancy package housing the Long Ranger ADCP and pole compass on Mooring 1606 at the South-Central Site

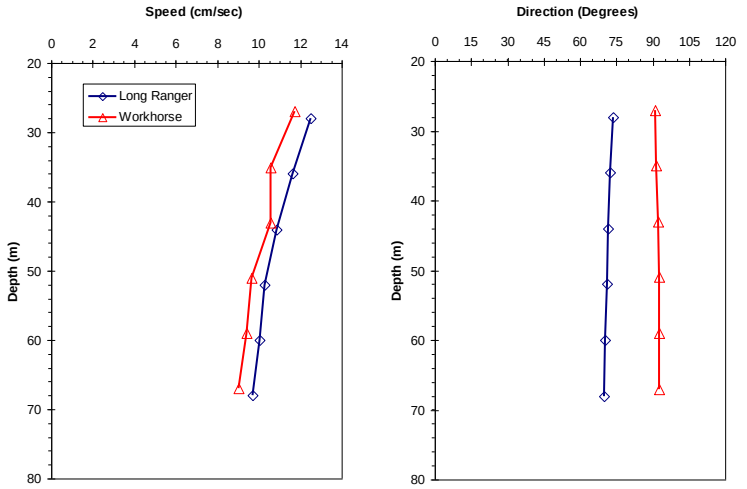


This figure illustrates the changes in pitch angle of the instrument assembly on mooring 1606 caused by a slow leak in one of the buoyancy elements during the 2006-2007 deployment, as measured by the pole compass. Until Dec. 8, 2006, the pitch averaged an acceptable 2.4 degrees. Between Dec. 17, 2006 and Jan 20, 2007 it averaged 17.8 degrees. It then increased for a second time, to an average of 29.8 degrees, from Jan 23, 2007 until the end of the mooring period. The ADCP was unable to correct for pitch due to a bug in the firmware. Resulting errors are illustrated in Figure 8.

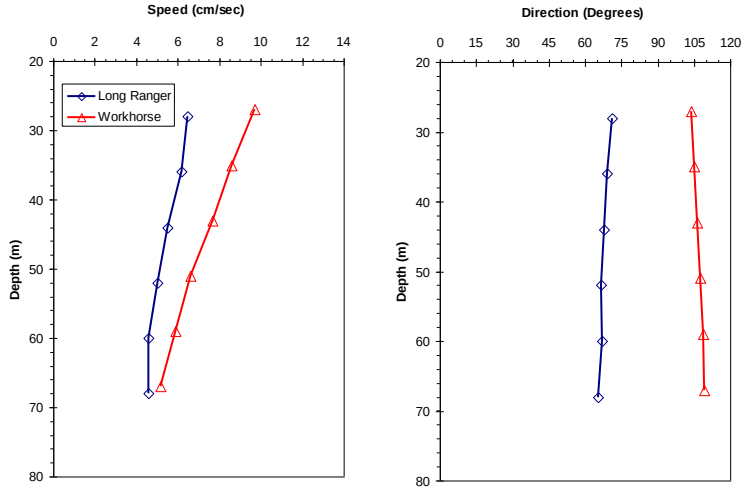
Figure 8: South-Central Barrow Strait, Long Ranger (LRADCP) vs. Workhorse ADCP (WHADCP) showing rate under-reading and direction error of LRADCP due to pitch angles.

Vector Mean Velocities

Period Aug. 5, 2006 to Dec 8, 2006 (Average Pitch = 2.4 Degrees)



Period Dec. 17, 2006 to Jan 20, 2007 (Average Pitch = 17.8 Degrees)



Period Jan. 23, 2007 to Jul 28, 2007 (Average Pitch = 29.8 Degrees)

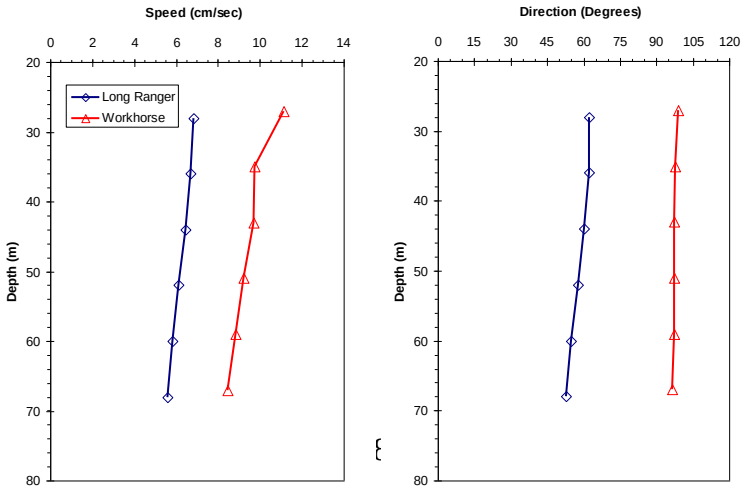


Figure 9: Progressive Vector Diagram, South Side Barrow Strait. Aug. 5, 2006 – July 29, 2007

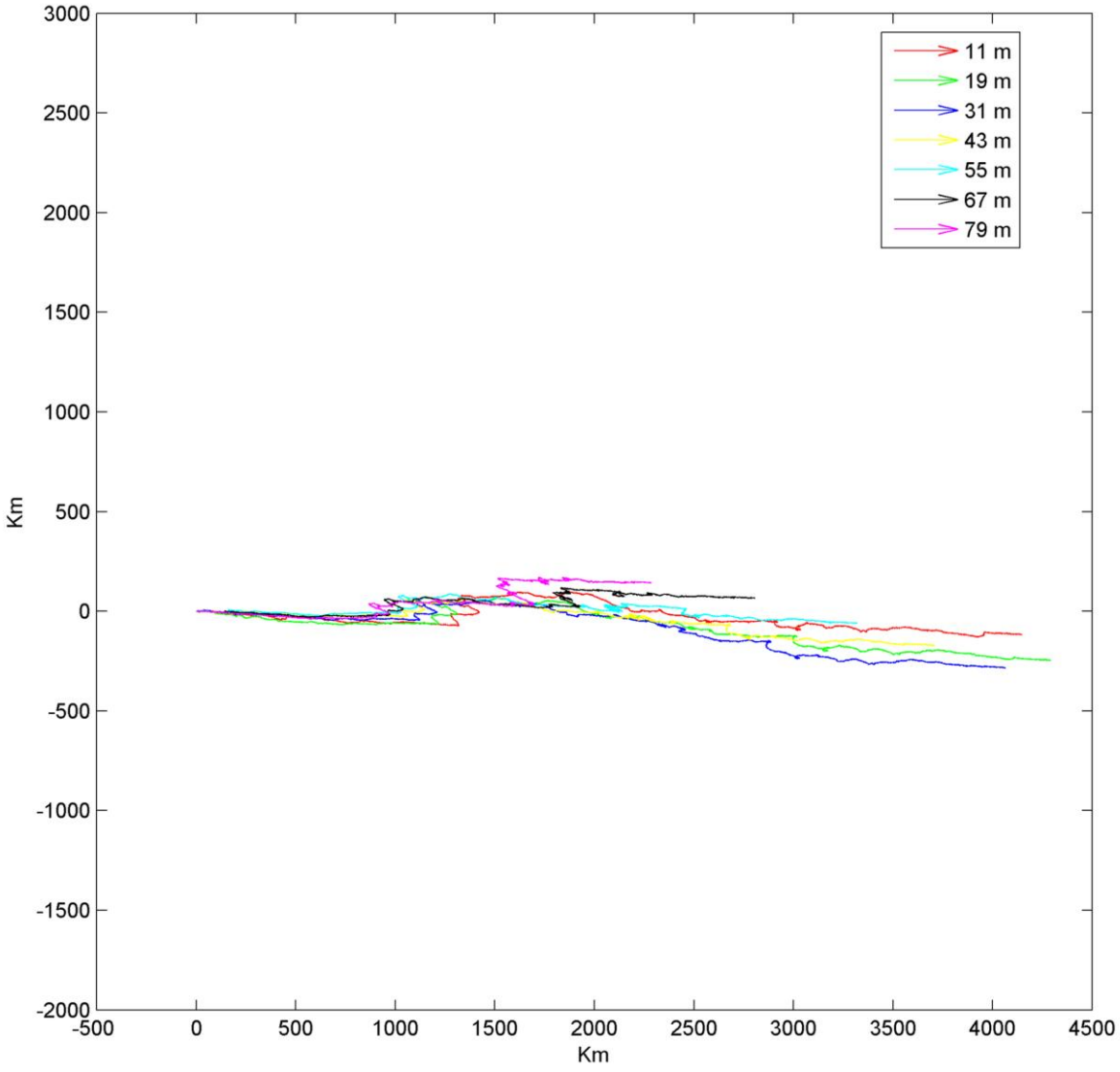
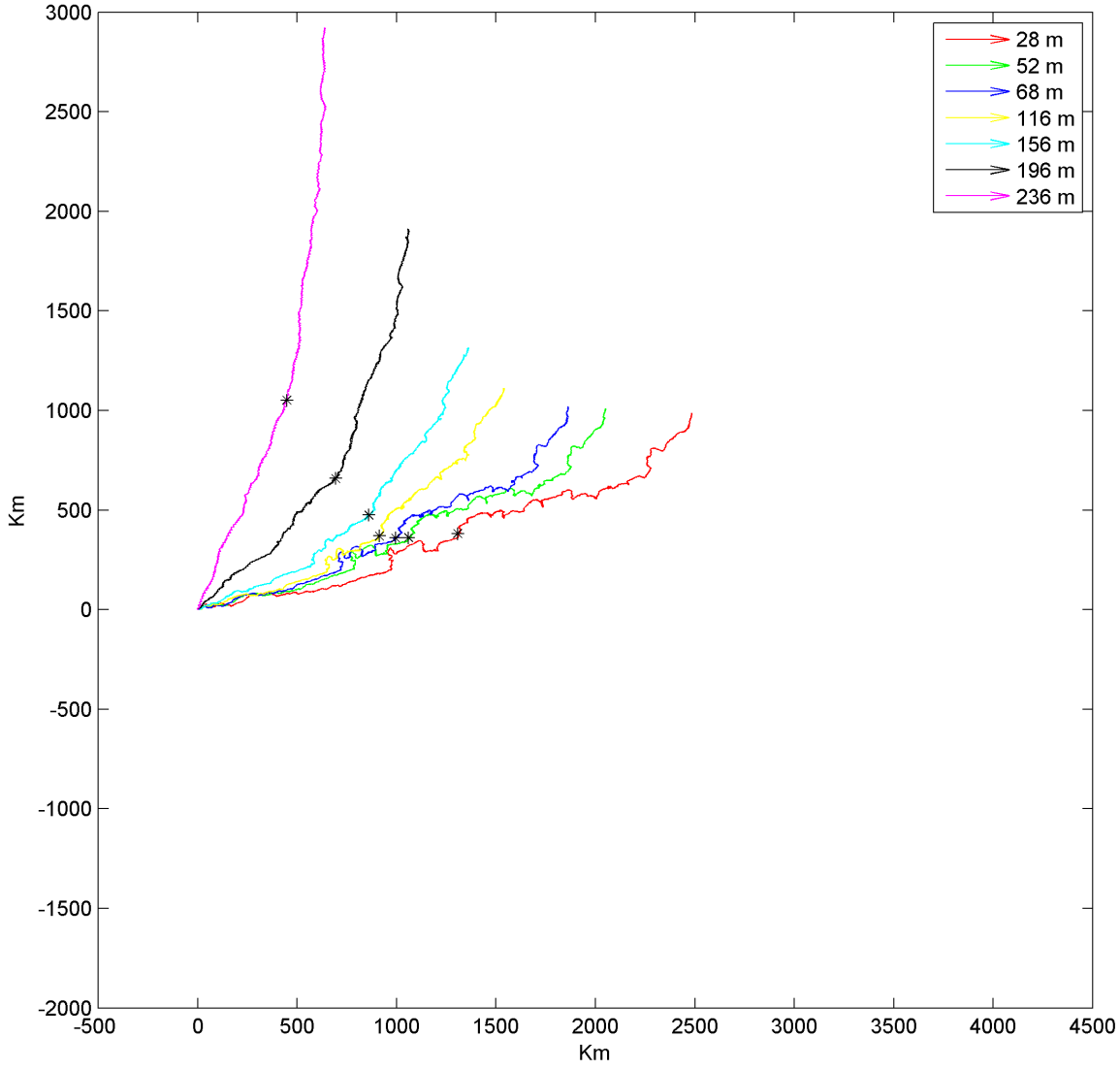


Figure 10: Progressive Vector Diagram, South-Central Barrow Strait. (Long Ranger ADCP)† Aug. 5, 2006 – July 29, 2007



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)
* Indicates Dec 8, 2006, when the instrument tilt started.

Figure 11: Progressive Vector Diagram, South-Central Barrow Strait. (Workhorse ADCP) Aug. 5, 2006 – July 28, 2007

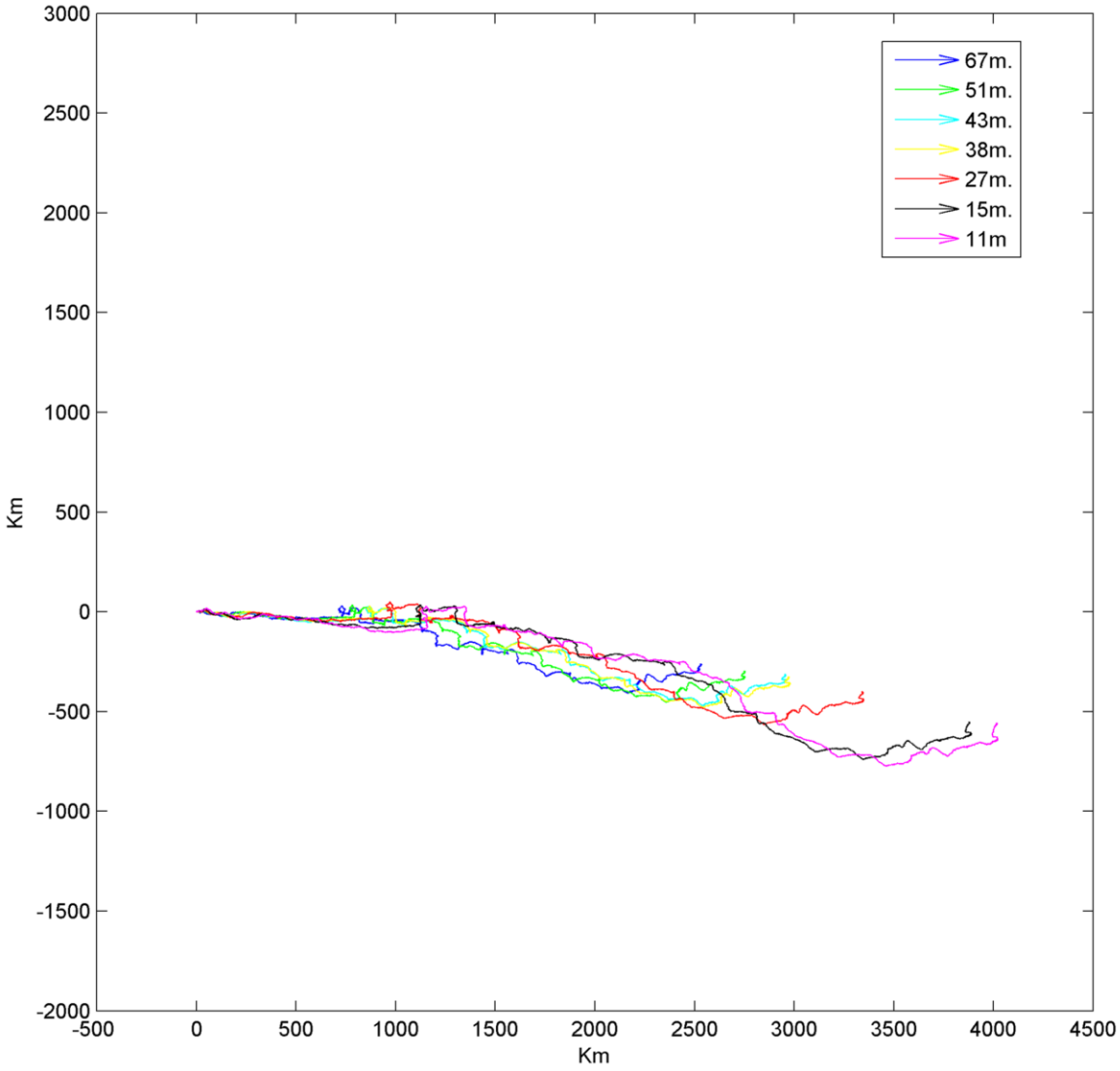


Figure 12: Bi-hourly current data, South Side Barrow Strait. Sep. 1, 2006 – Sep. 30, 2006

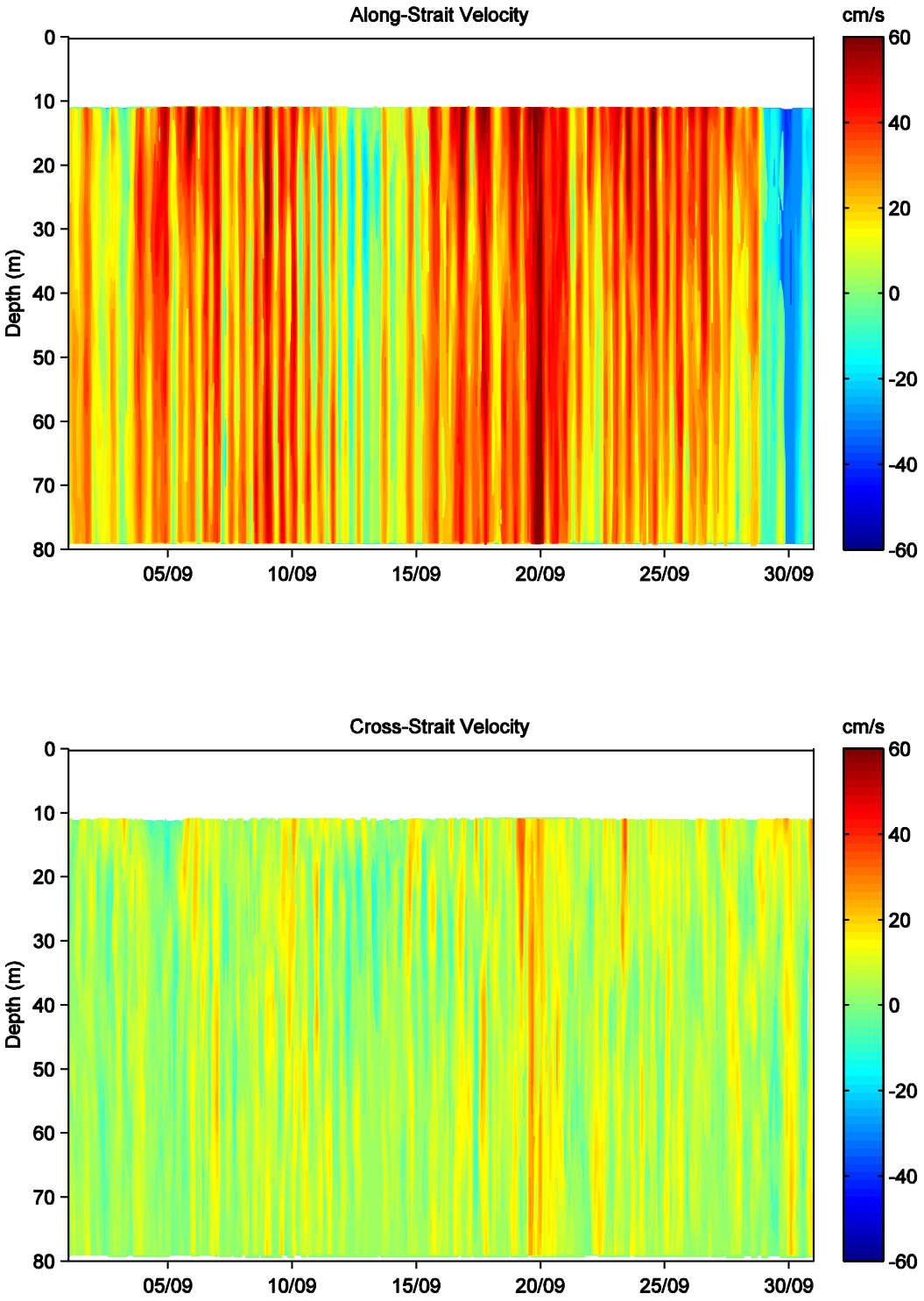
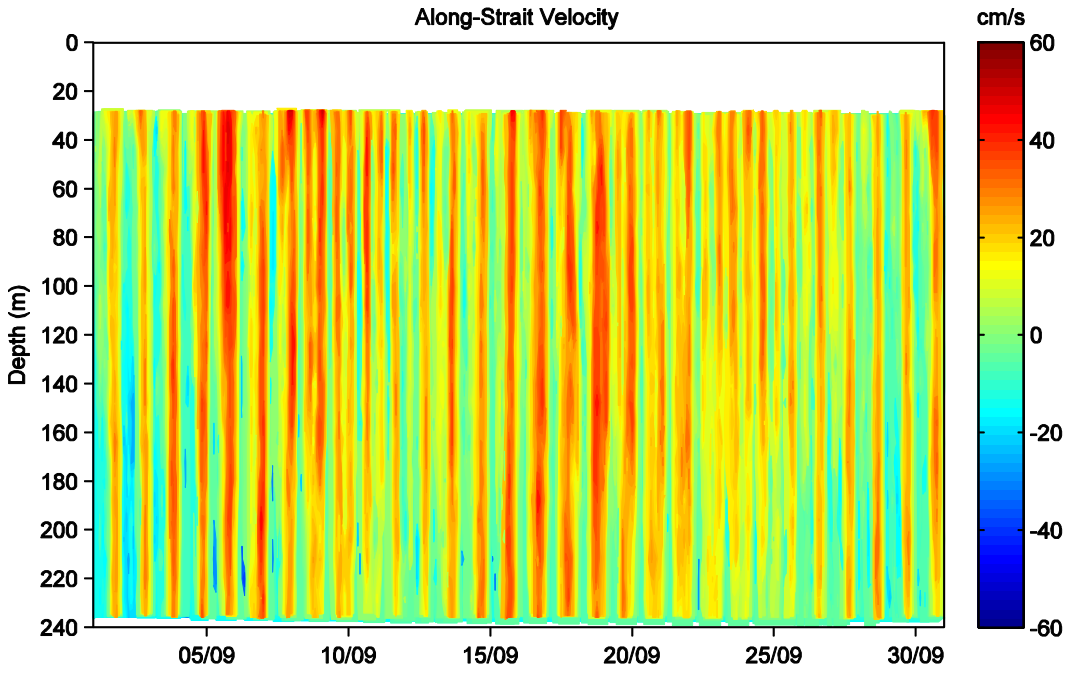


Figure 13: Bi-hourly current data, South-Central Barrow Strait. (Long Ranger ADCP), Sep. 1, 2006 – Sep. 30, 2006



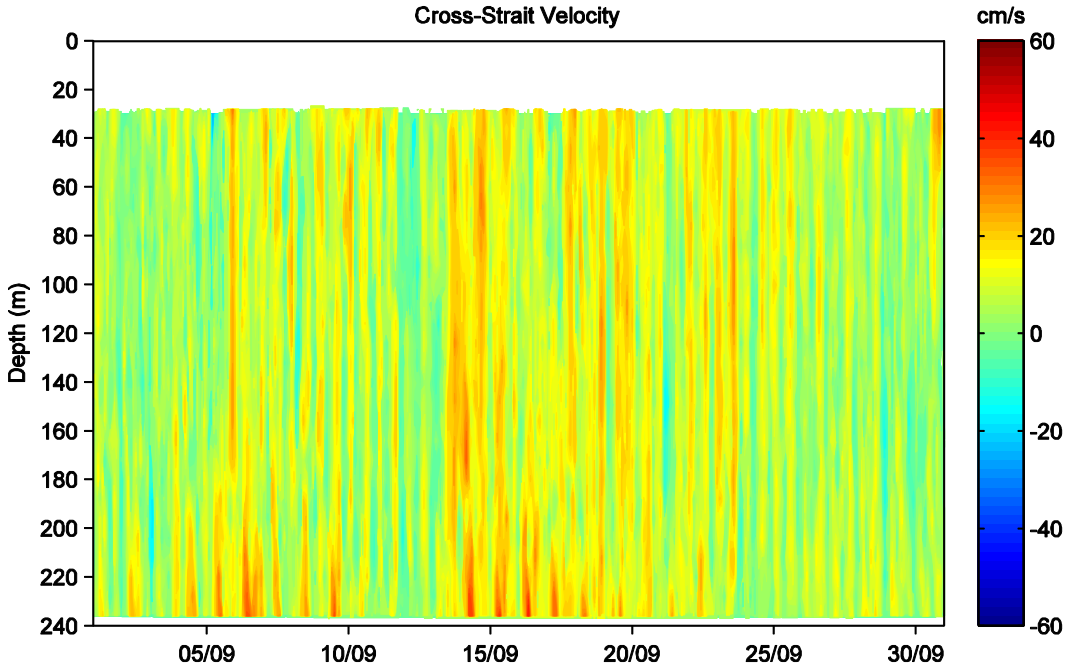


Figure 14: Bi-hourly current data, South-Central Barrow Strait. (Workhorse ADCP) Sep. 1, 2006 – Sep. 30, 2006

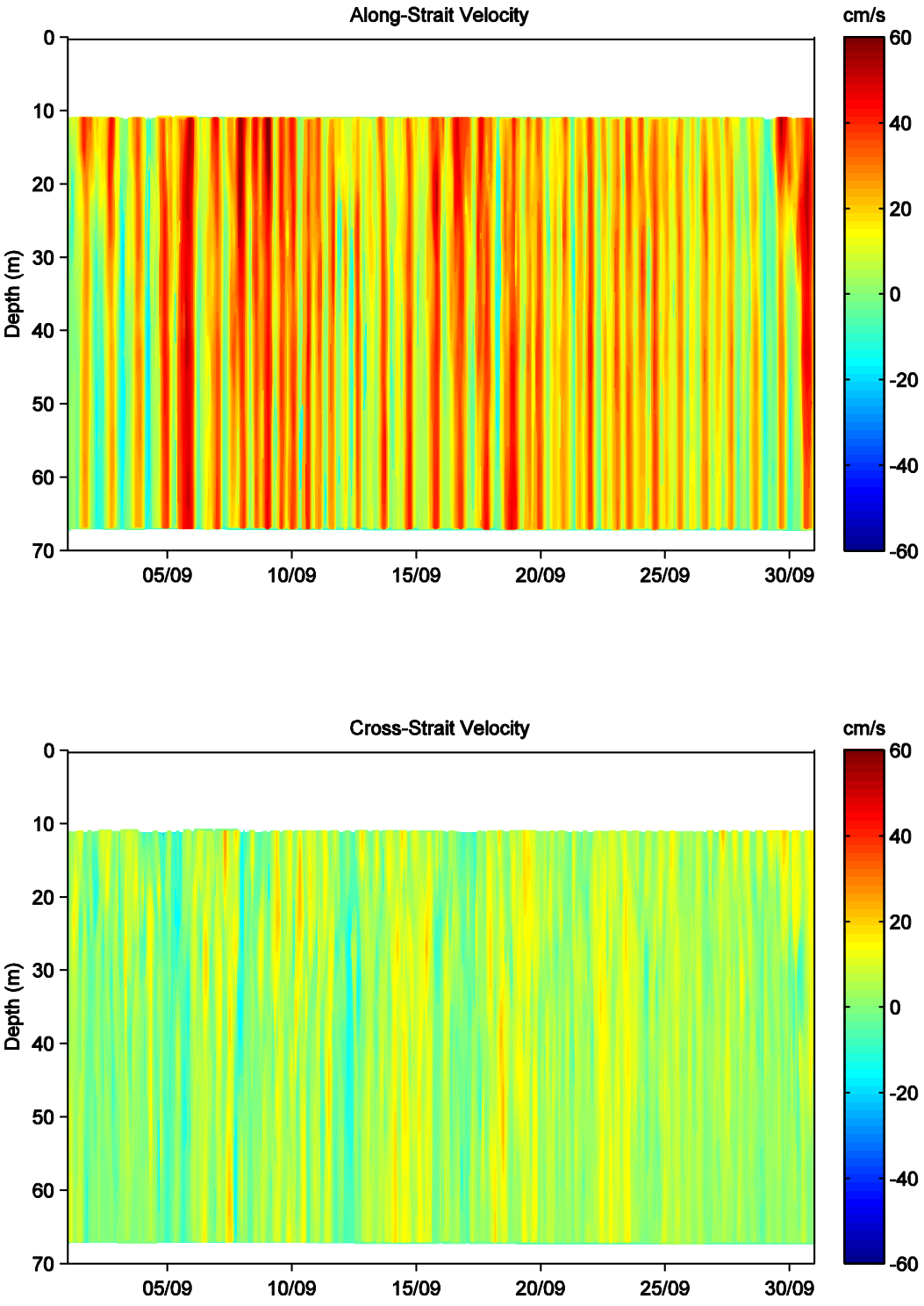


Figure 15: Low-pass filtered currents, South Side Barrow Strait. August 2006 – July 2007

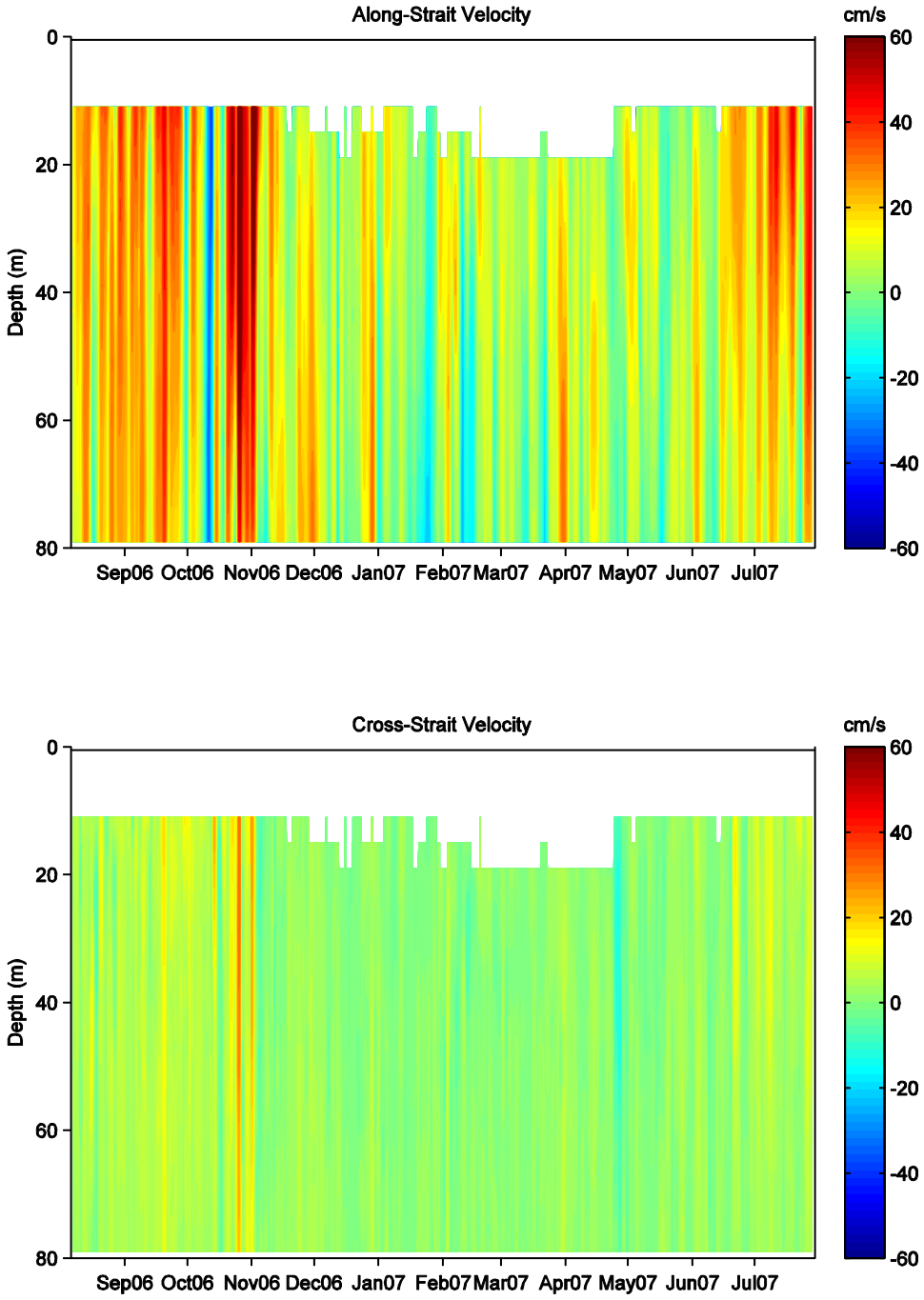
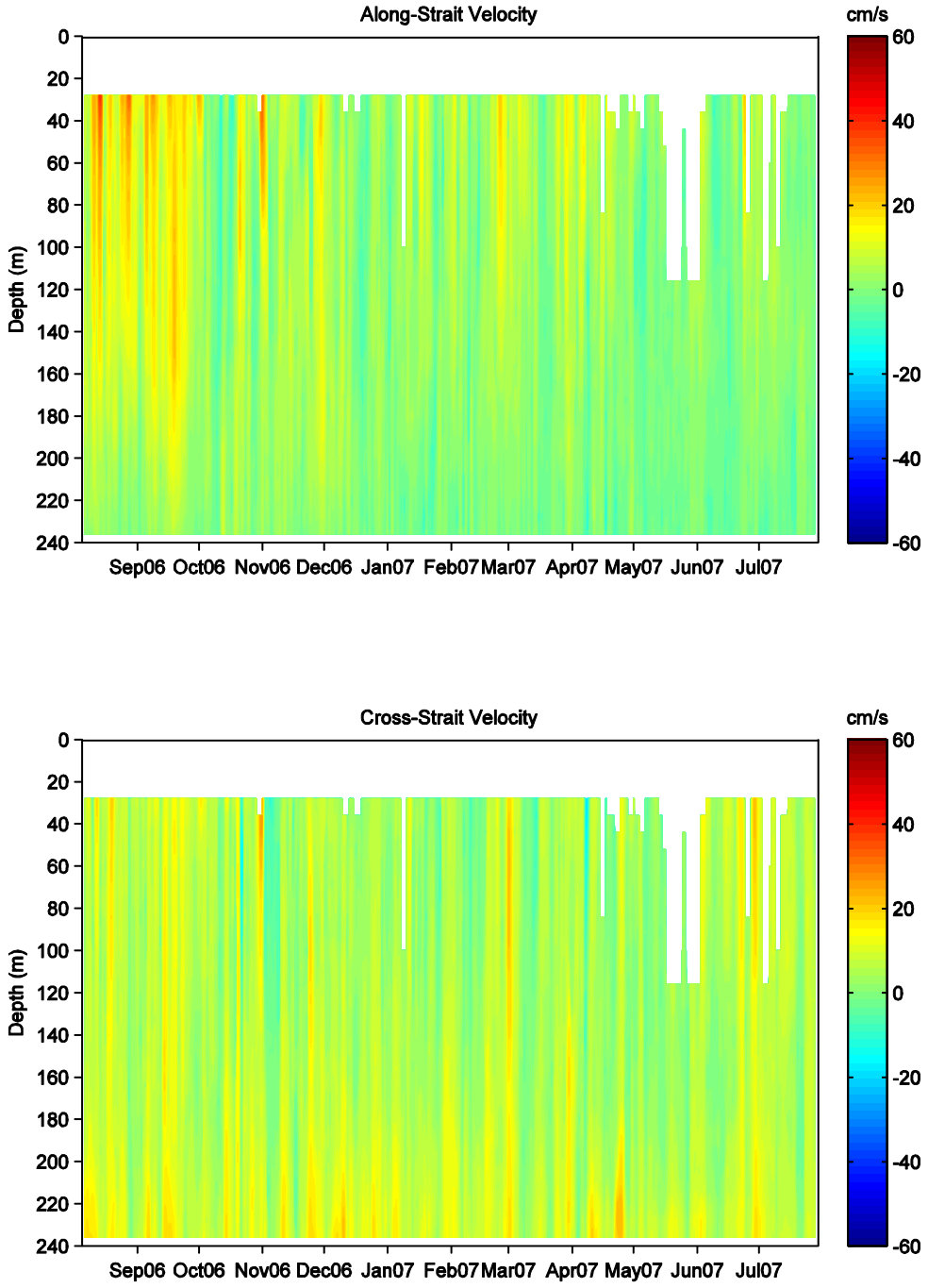


Figure 16: Low-pass filtered currents, South-Central Barrow Strait. (Long Ranger ADCP)† August 2006 – July 2007



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 17: Low-pass filtered currents, South-Central Barrow Strait. (Workhorse ADCP) August 2006 - July 2007

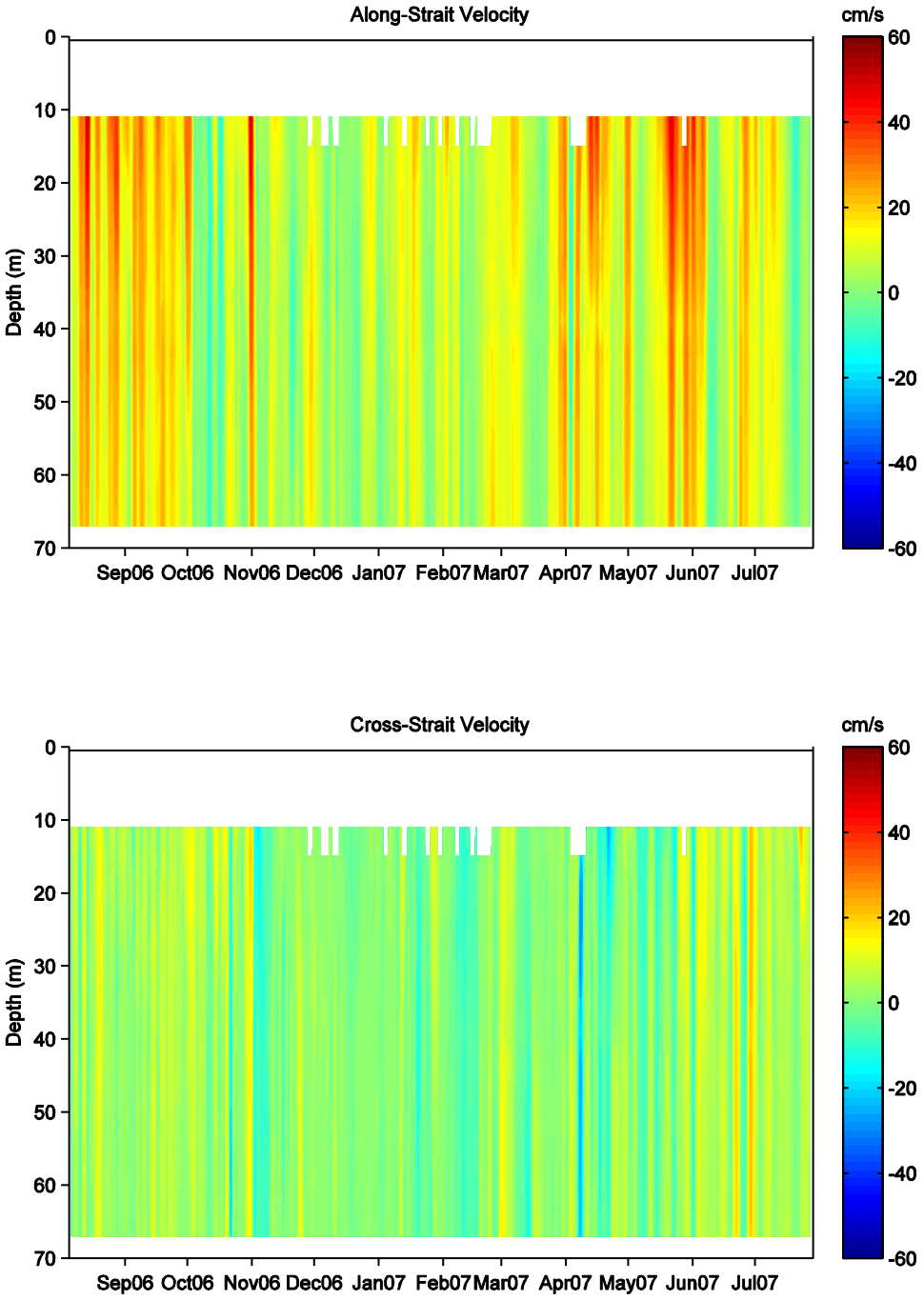


Figure 18: Low-pass filtered T,S (47 m.) and current data (47 m.). South Side Barrow Strait: August 2006 - July 2007.

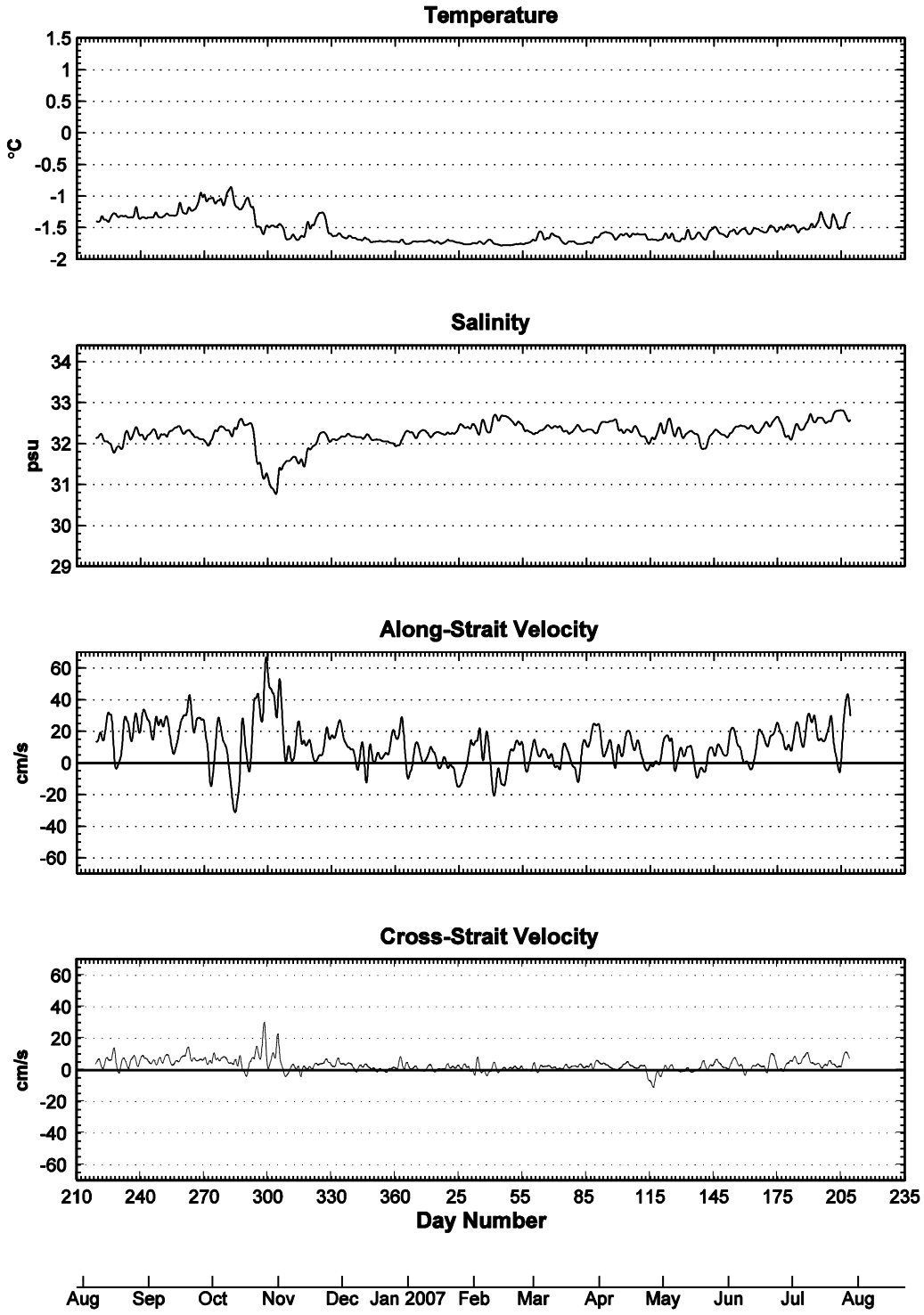


Figure 19: Low-pass filtered T,S (62 m.) and current data (63 m.). South Side Barrow Strait: August 2006 – July 2007.

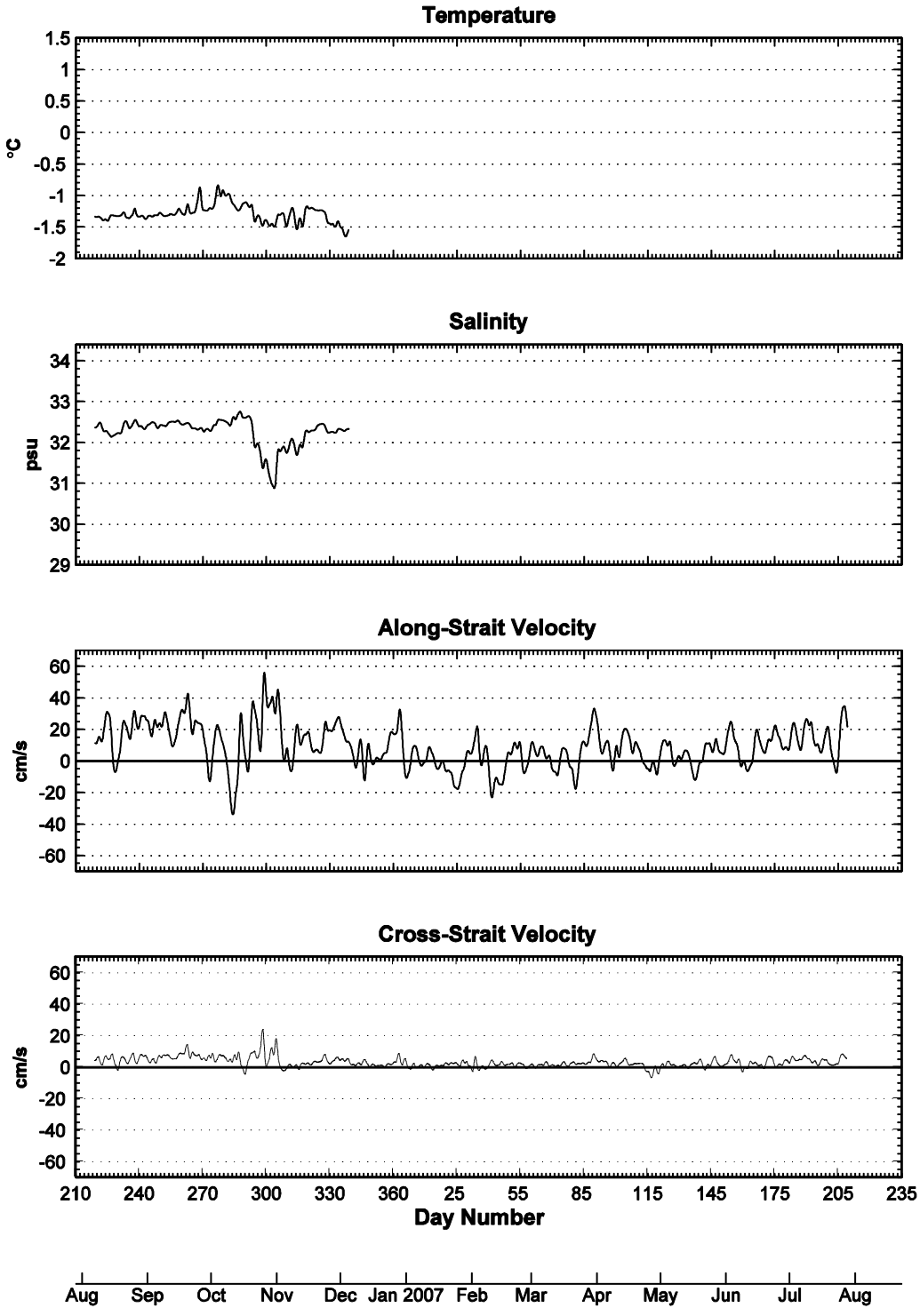


Figure 20: Low-pass filtered T,S (87 m.) and current data (79 m.). South Side Barrow Strait: August 2006 – July 2007.

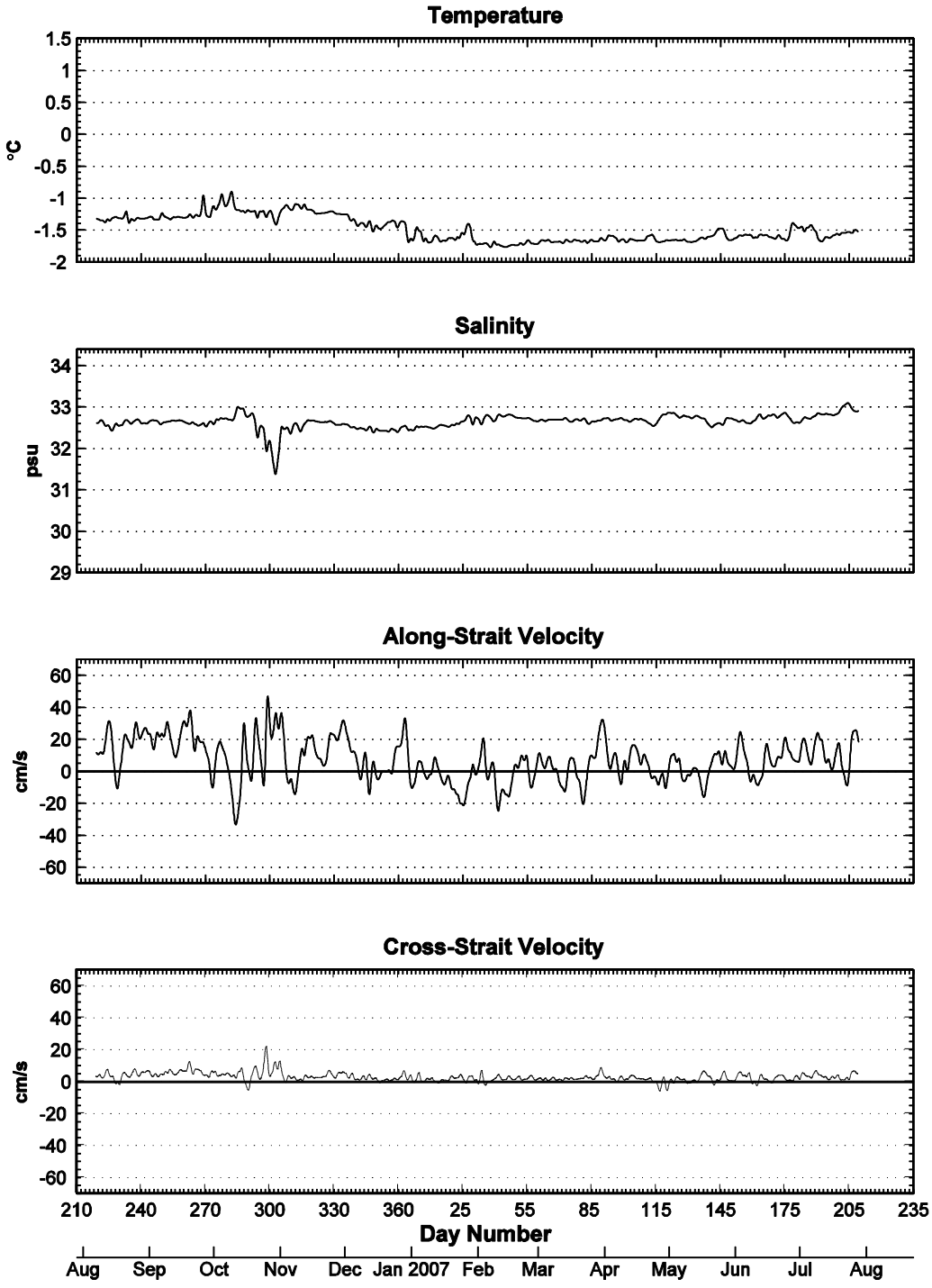


Figure 21: Low-pass filtered T,S (144 m.)
South Side Barrow Strait: August 2006 – July 2007.

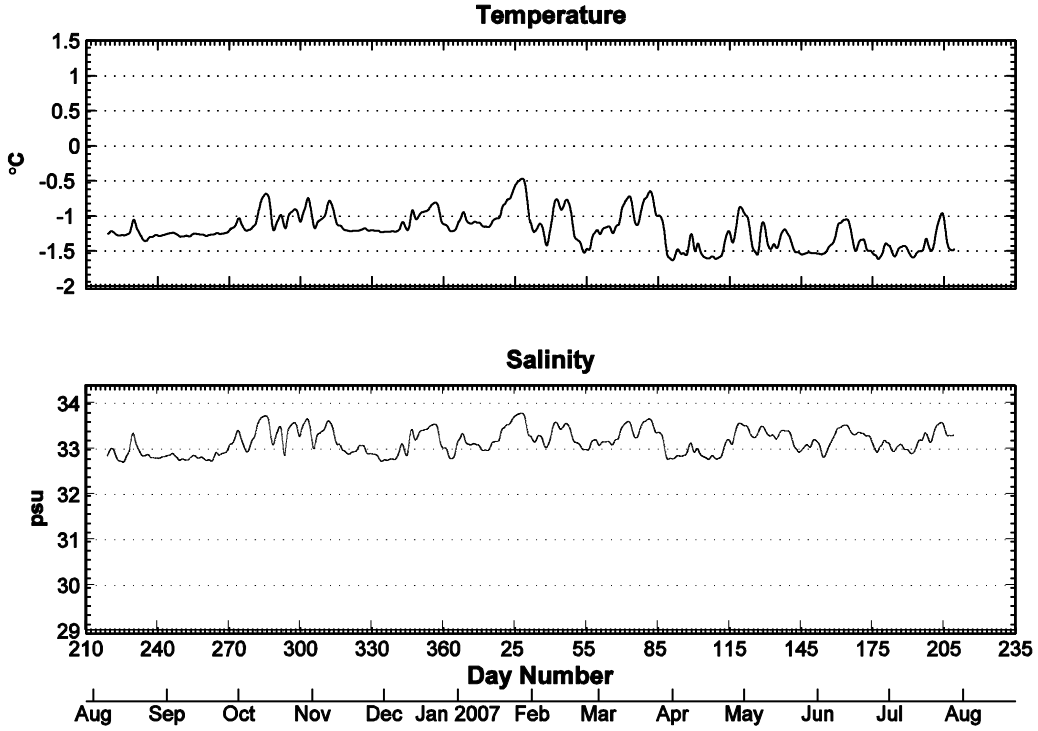


Figure 22: Low-pass filtered T,S (35 m.) and WHADCP current data (35 m.). South-Central Barrow Strait: August 2006 - July 2007.

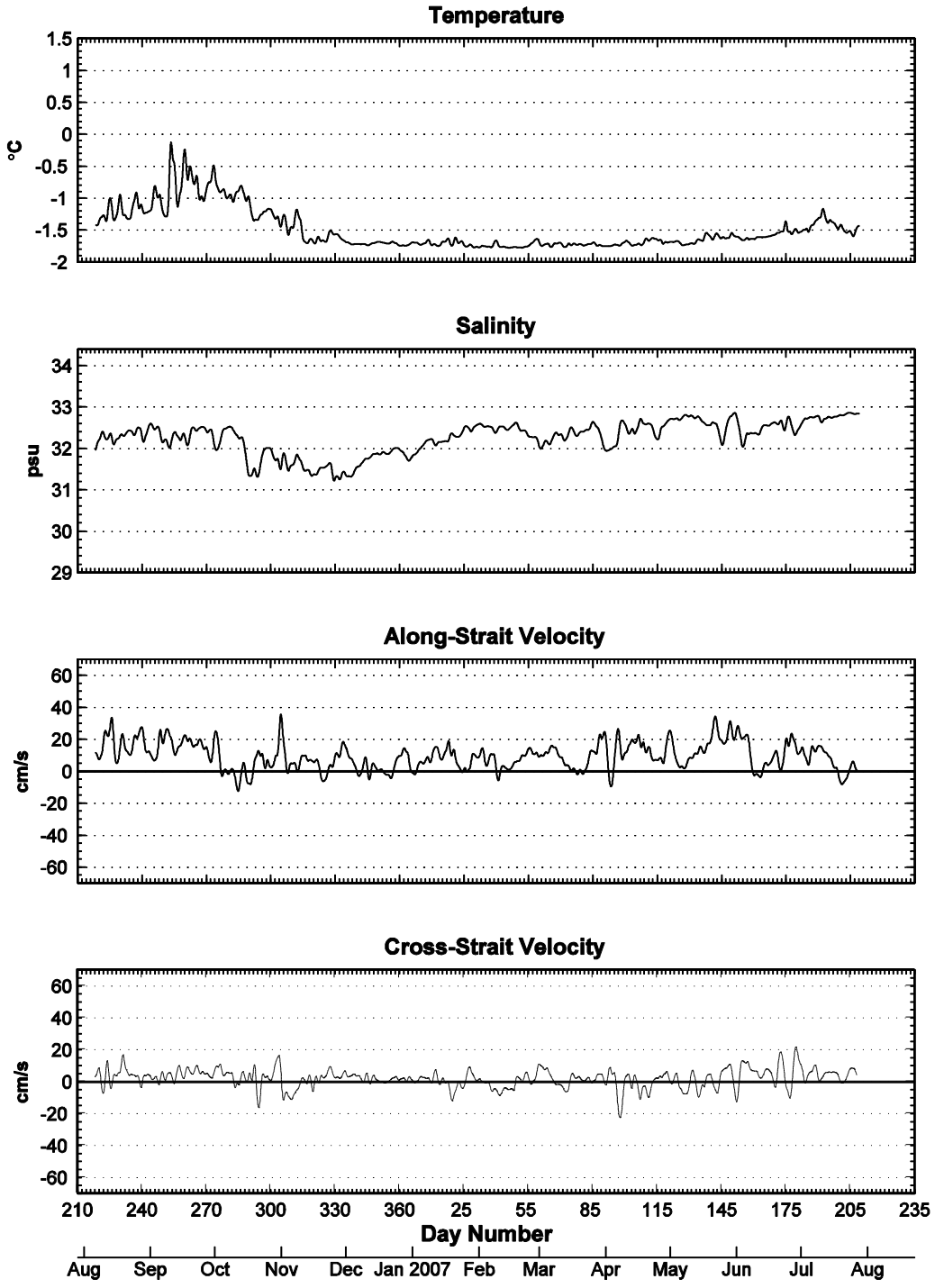
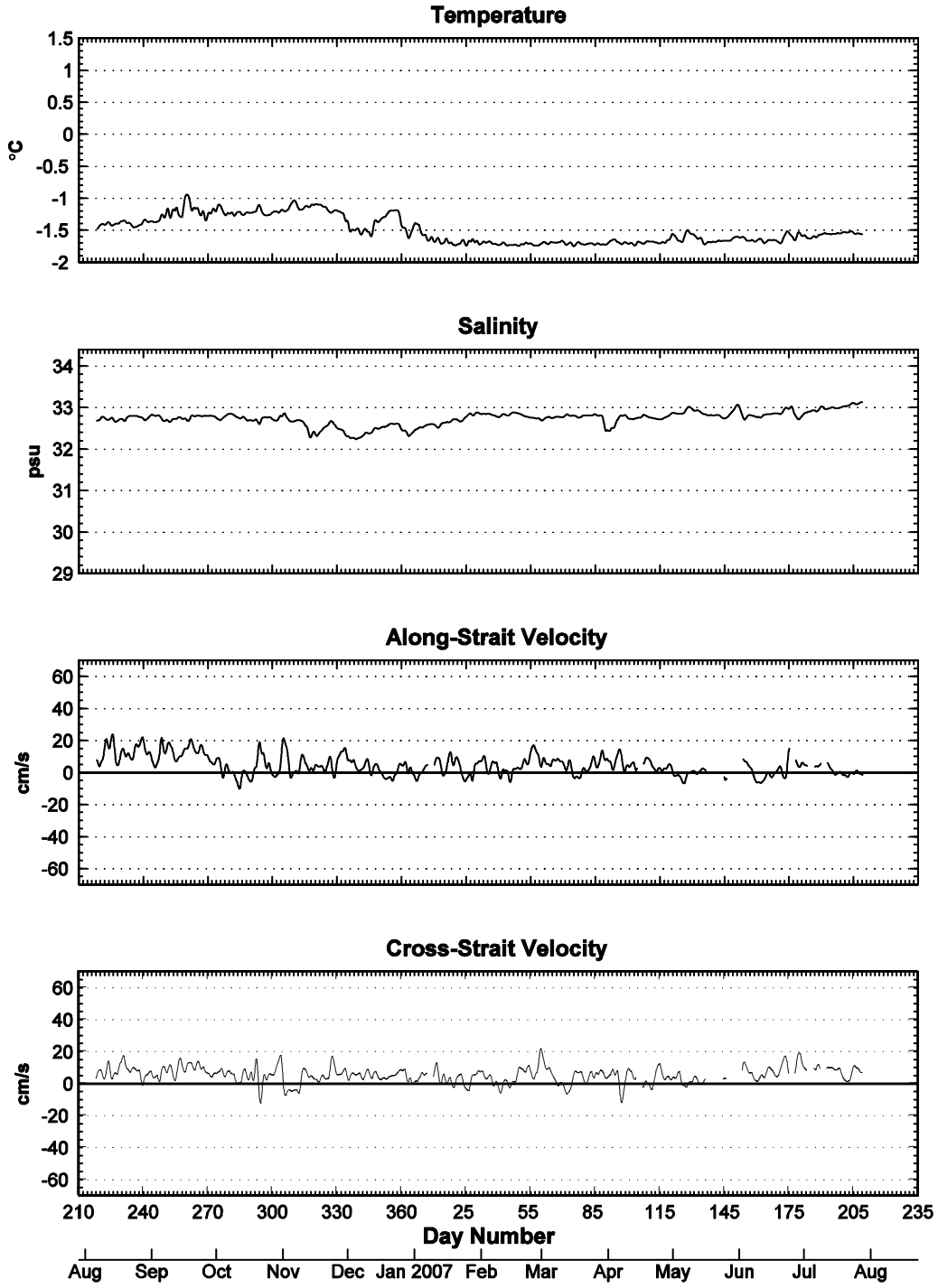
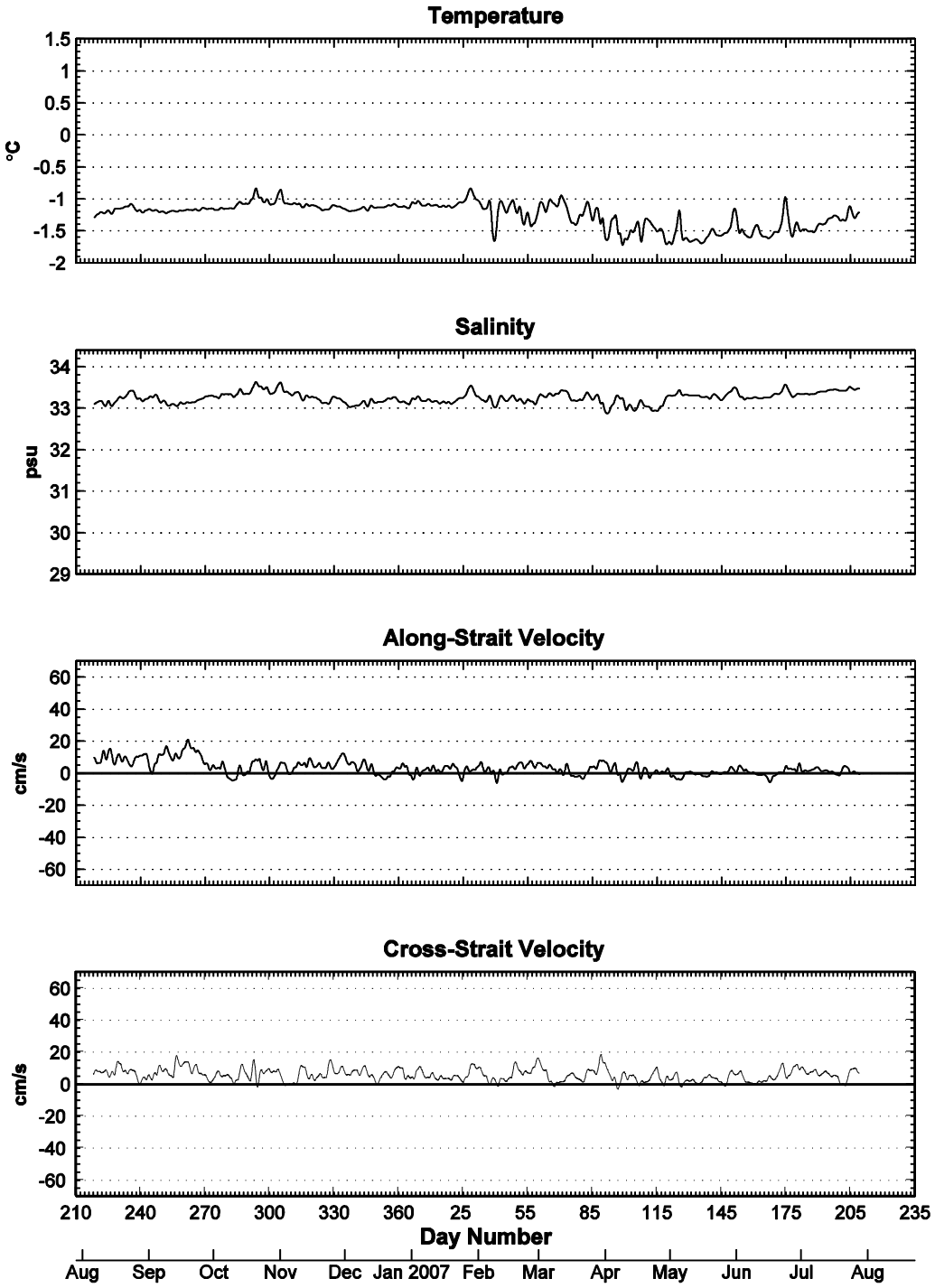


Figure 23: Low-pass filtered T,S (78 m.) and LRADCP† current data (76 m.). South-Central Barrow Strait: August 2006 - July 2007.



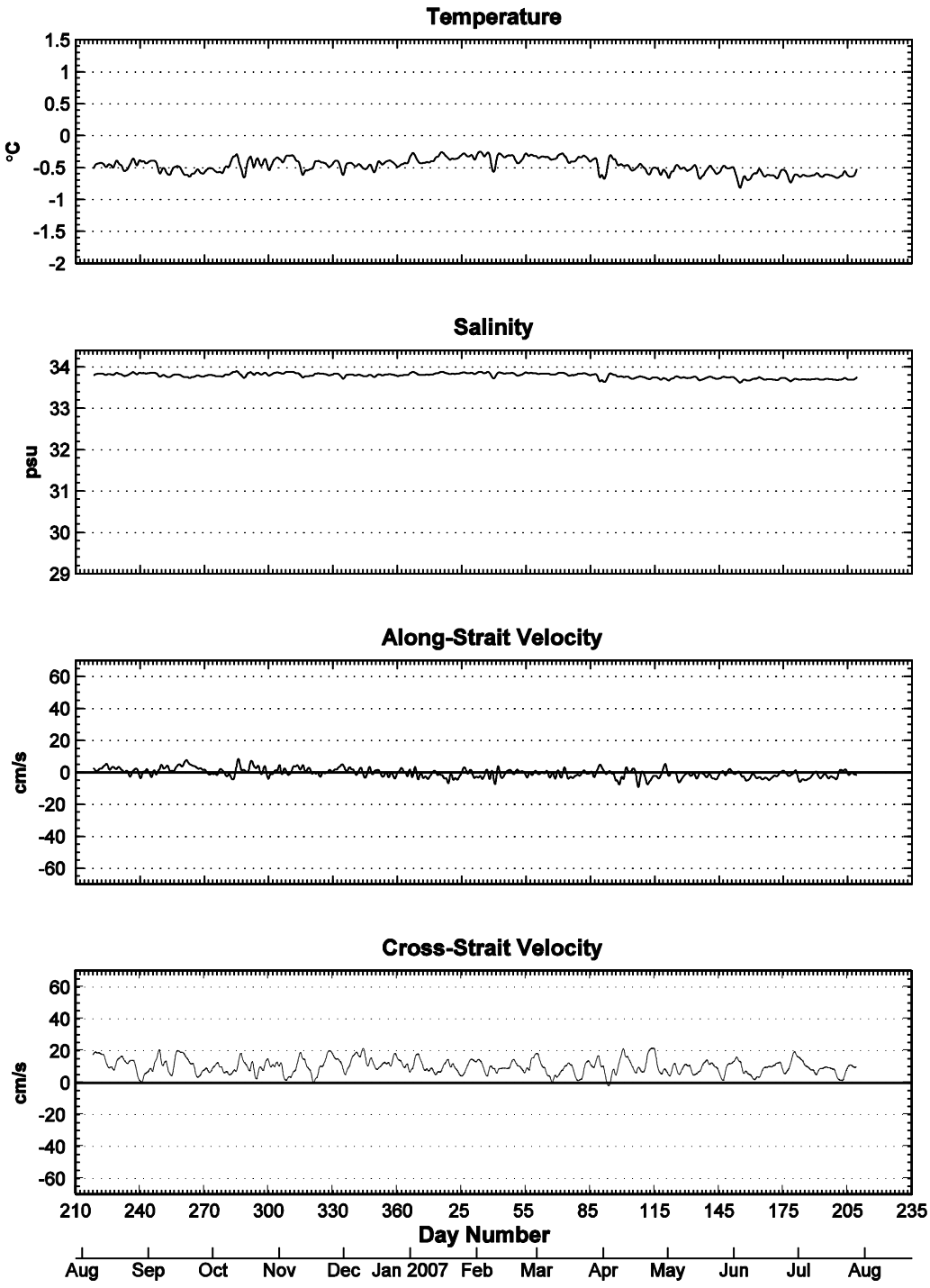
† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 24: Low-pass filtered T,S(155 m.) and LRADCP† current data (156 m). South-Central Barrow Strait: August 2006 – July 2007.



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 25: Low-pass filtered T,S(263 m) and LRADCP† current data (236 m.). South-Central Barrow Strait: August 2006 – July 2007.



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 26: Mean Flows, Aug. 5, 2006 to Jul. 29, 2007.

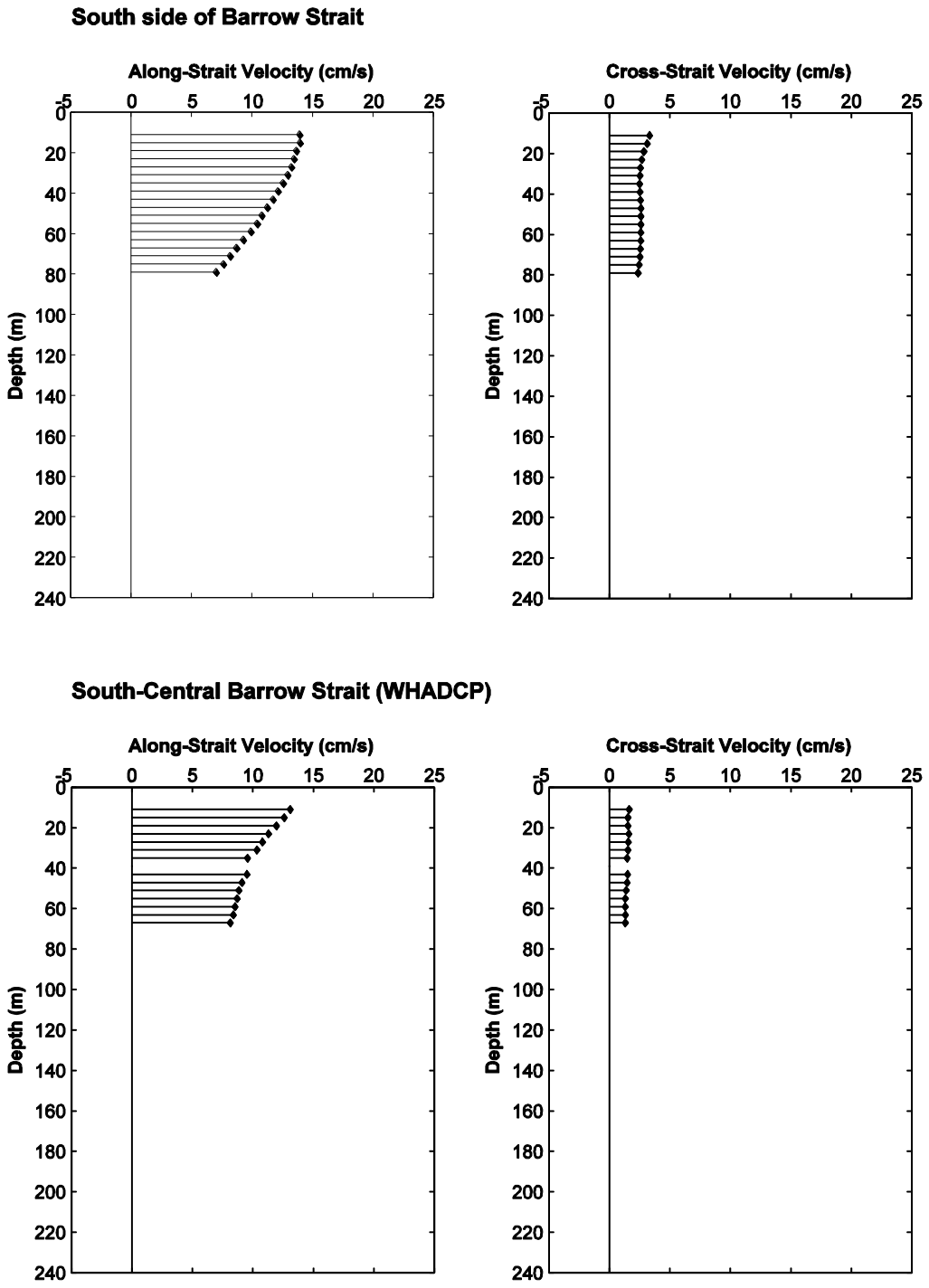
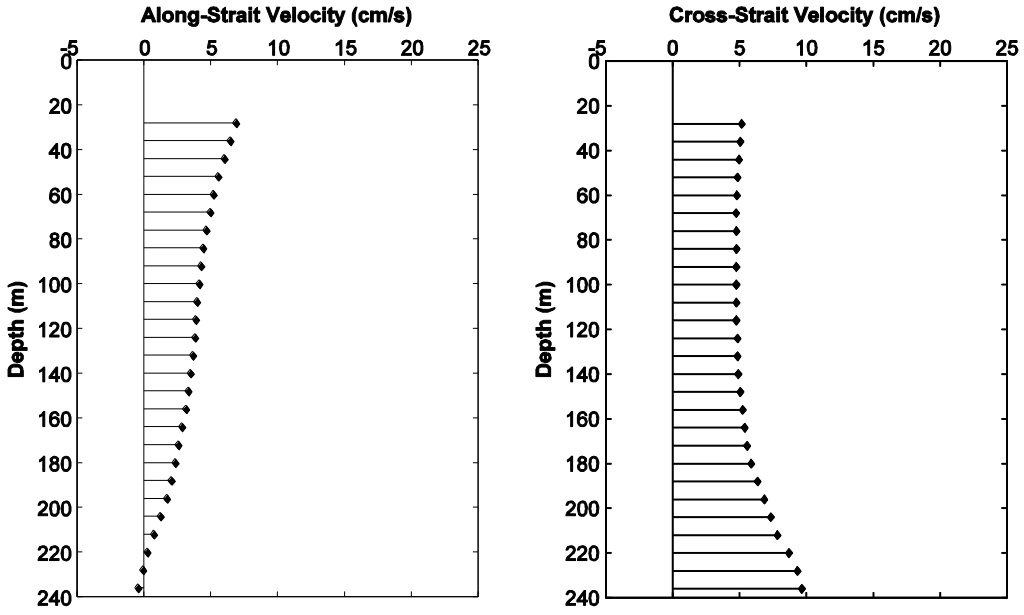


Figure 26: Mean Flows, Aug. 5, 2006 to Jul. 28, 2007. (continued)

South-Central Barrow Strait (LRADCP) †



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 27: Mean Flows, Late Summer: Aug. 2006 to Sep. 2006.

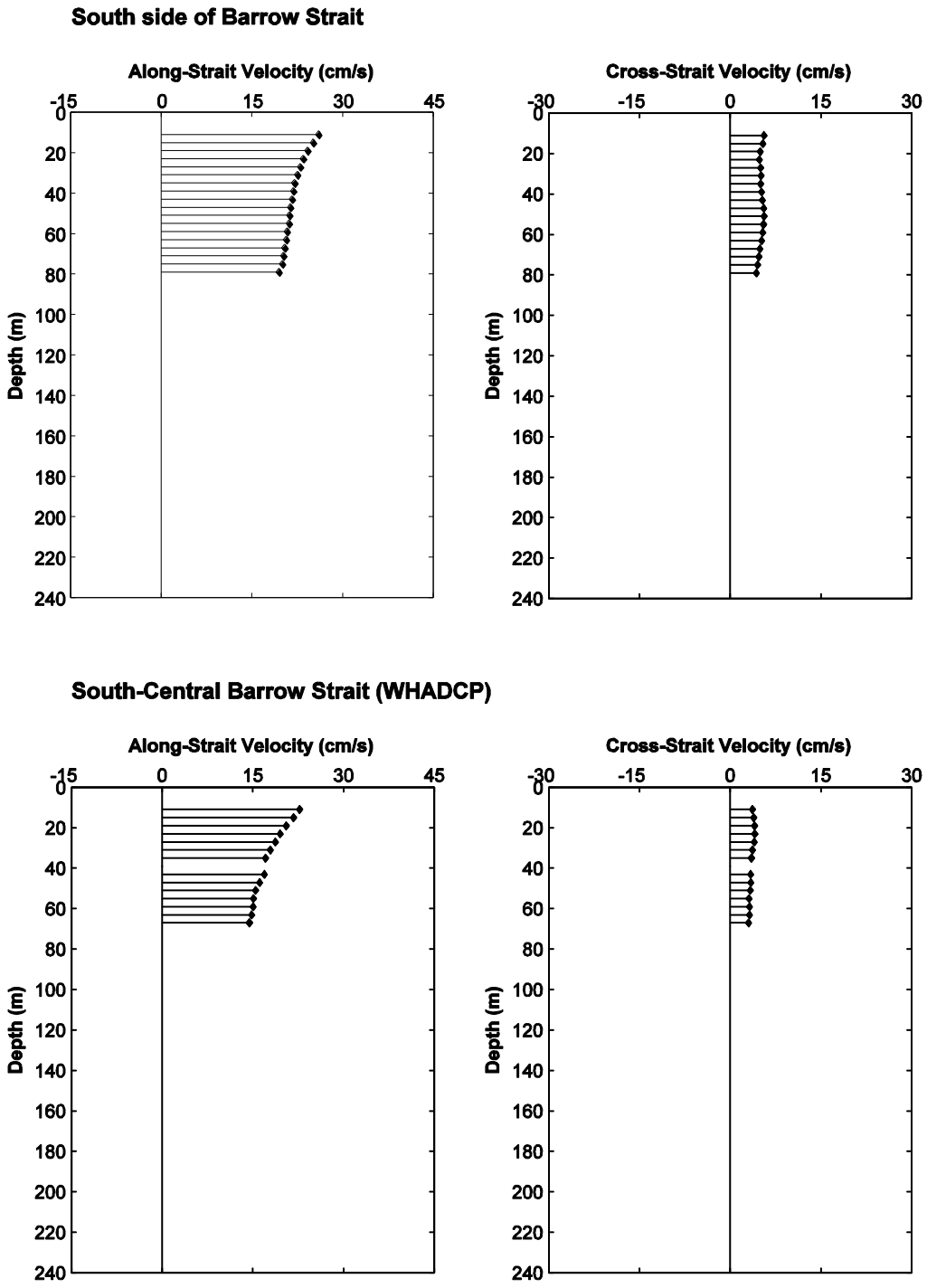
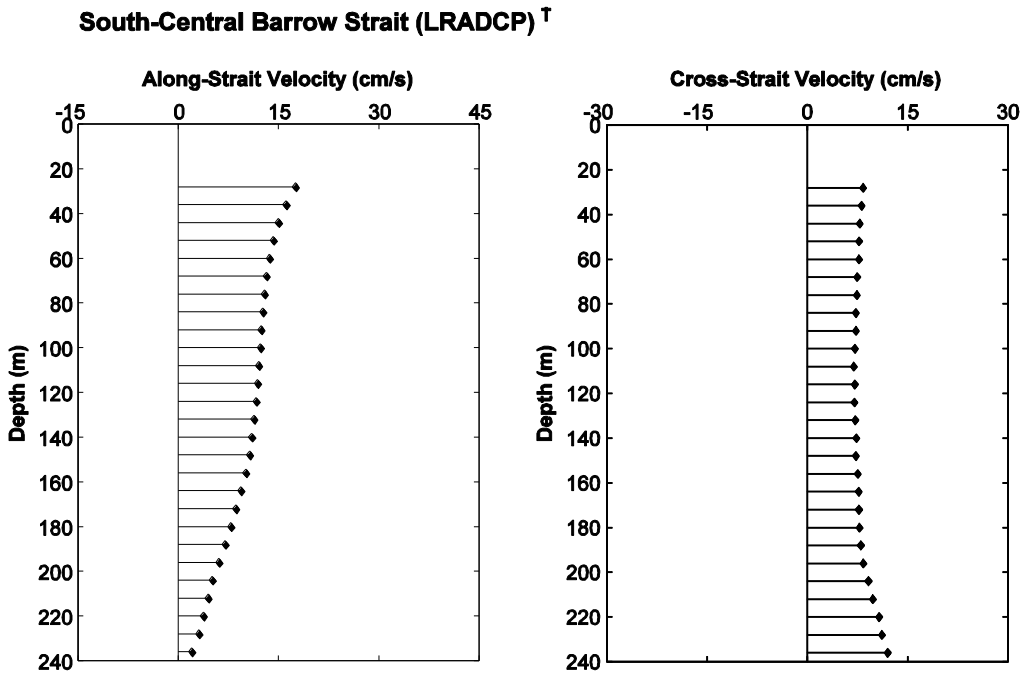


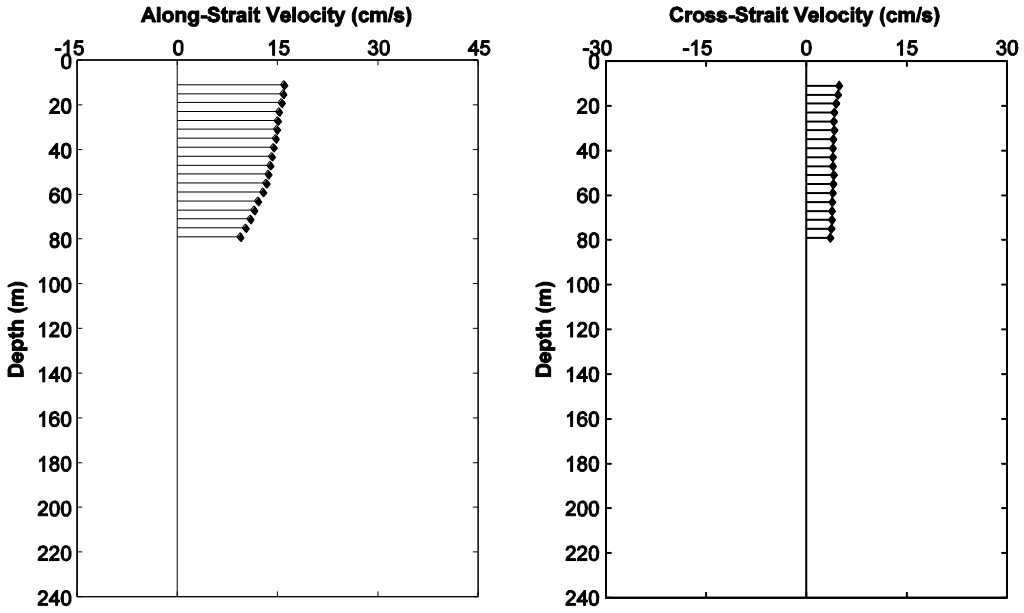
Figure 27: Mean Flows, Late Summer: Aug. 2006 to Sep. 2006 (continued)



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 28: Mean Flows, Fall: Sep. 2006 to Dec. 2006.

South side of Barrow Strait



South-Central Barrow Strait (WHADCP)

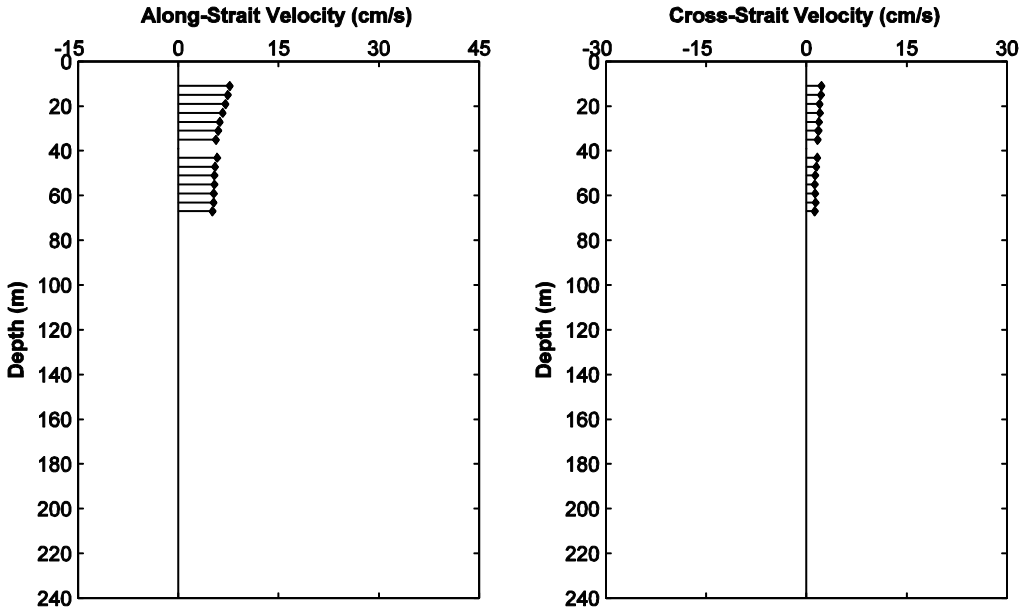
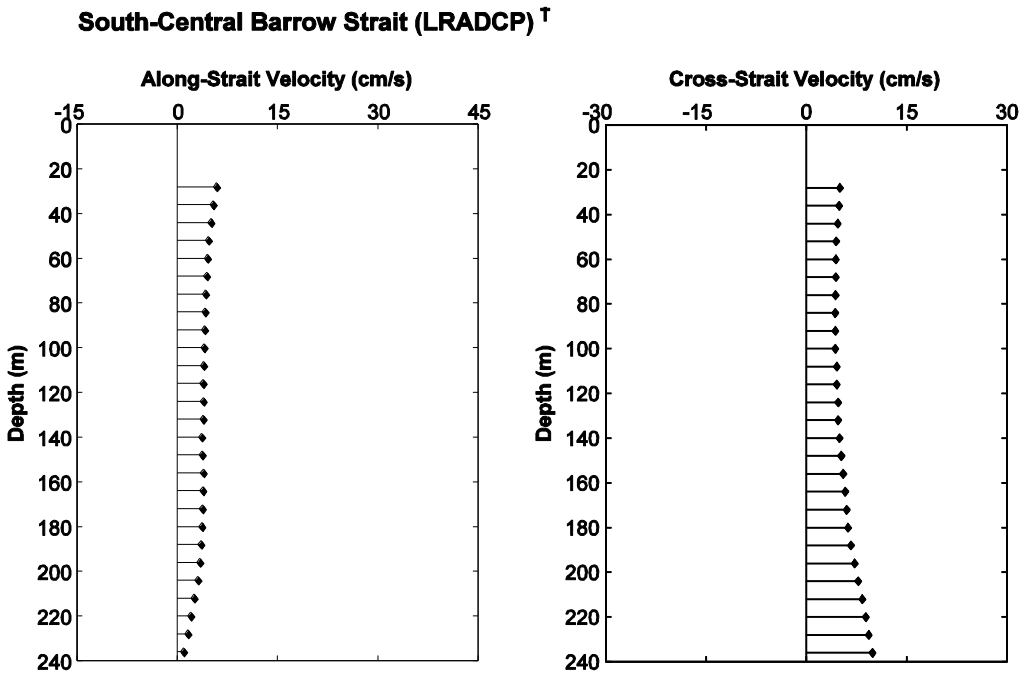


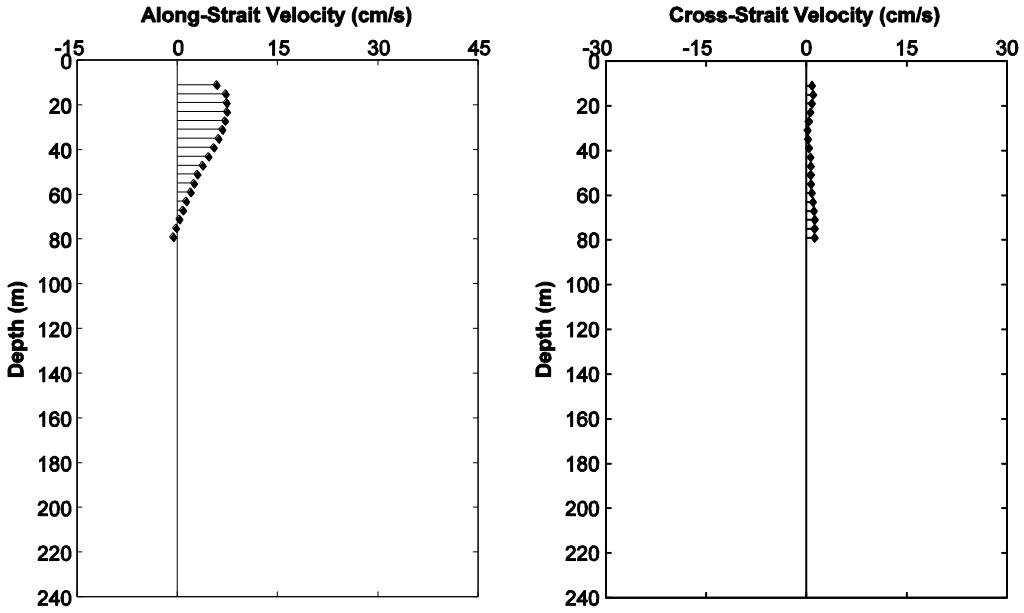
Figure 28: Mean Flows, Fall: Sep. 2006 to Dec. 2006 (continued).



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 29: Mean Flows, Winter: Dec. 2006 to Mar. 2007.

South side of Barrow Strait



South-Central Barrow Strait (WHADCP)

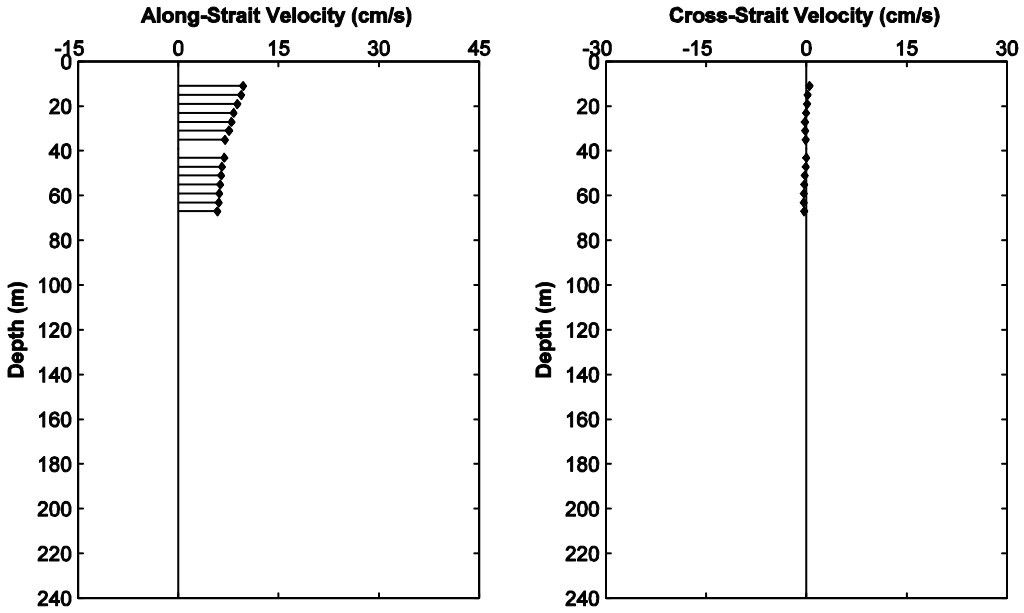
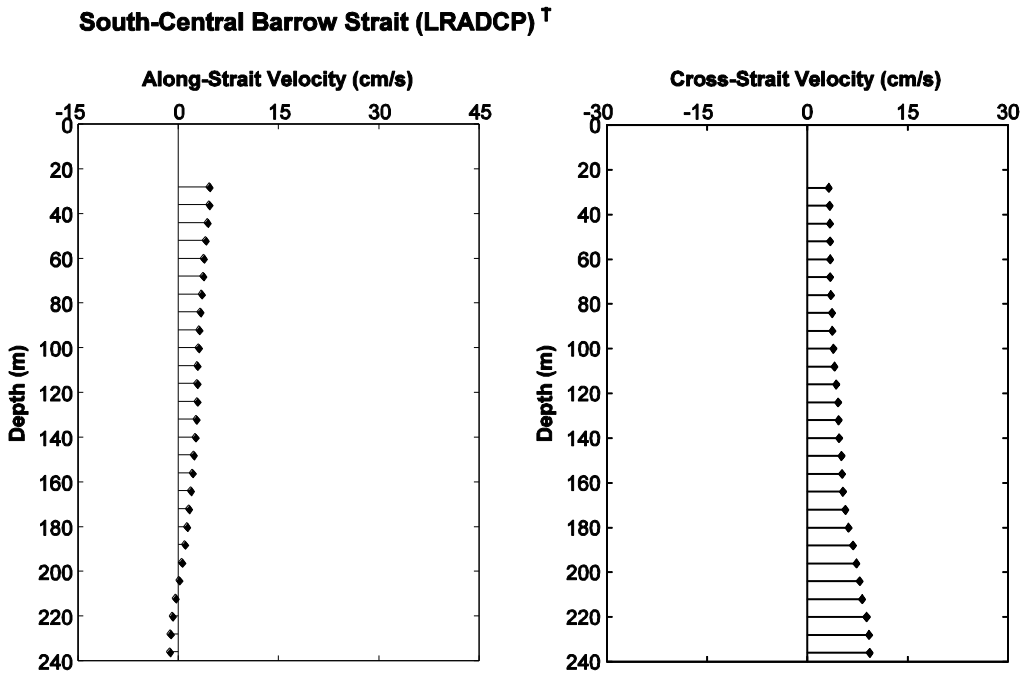


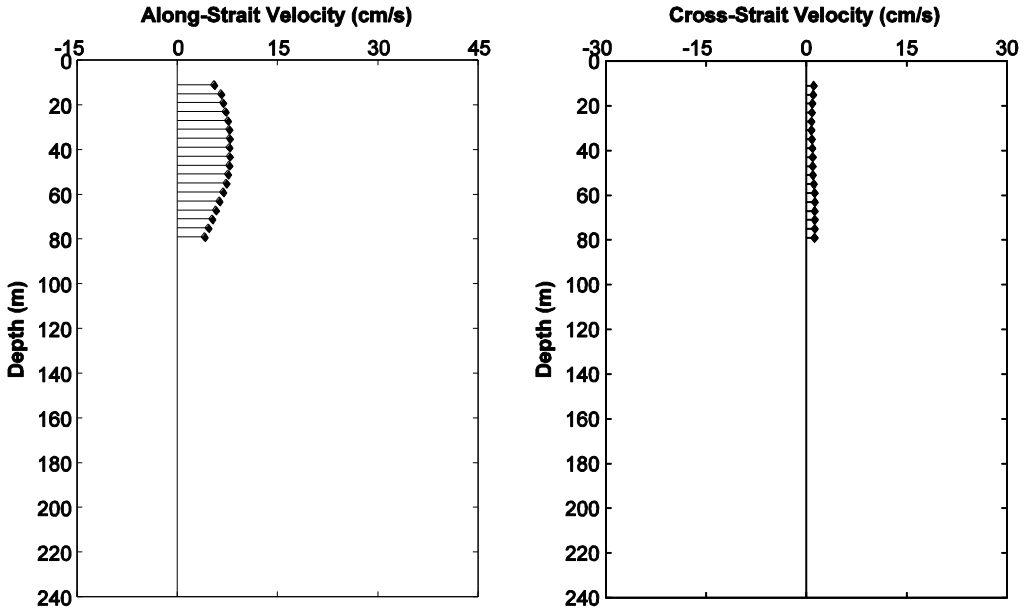
Figure 29: Mean Flows, Winter: Dec. 2006 to Mar. 2007 (continued).



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 30: Mean Flows, Spring: Mar. 2007 to Jun. 2007.

South side of Barrow Strait



South-Central Barrow Strait (WHADCP)

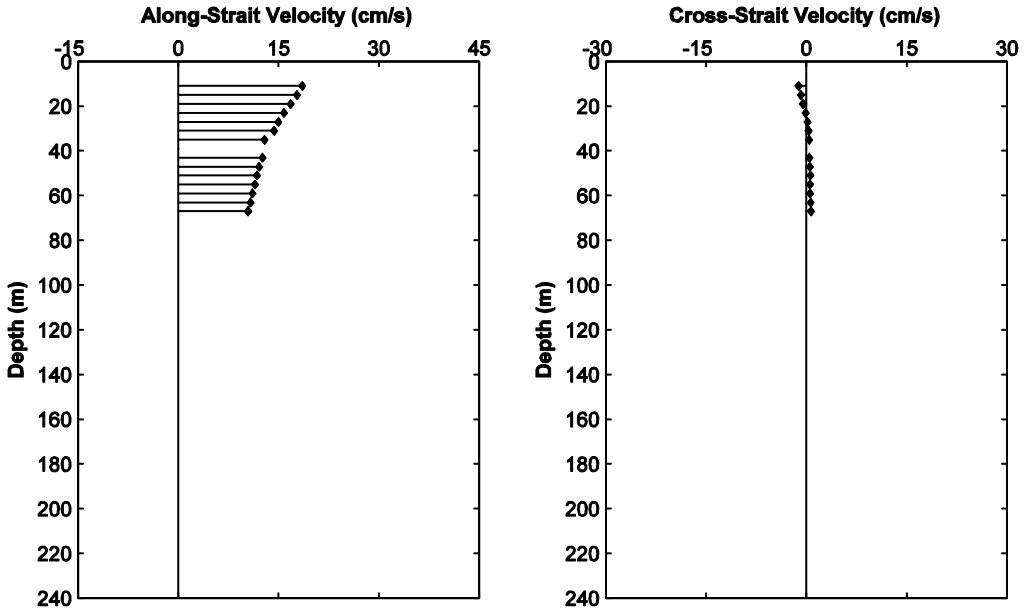
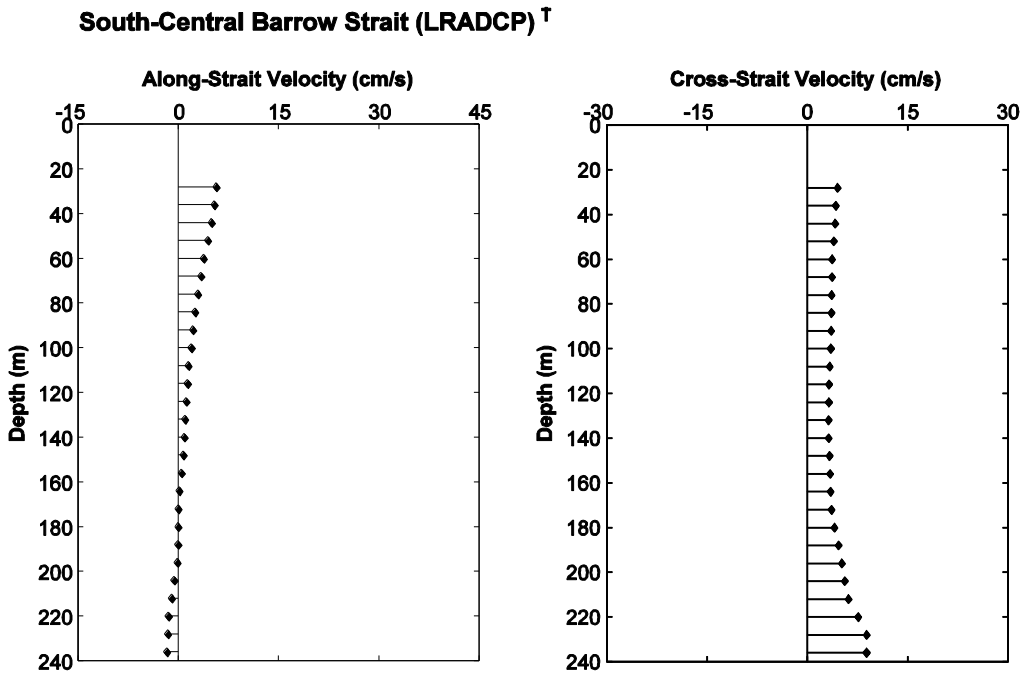


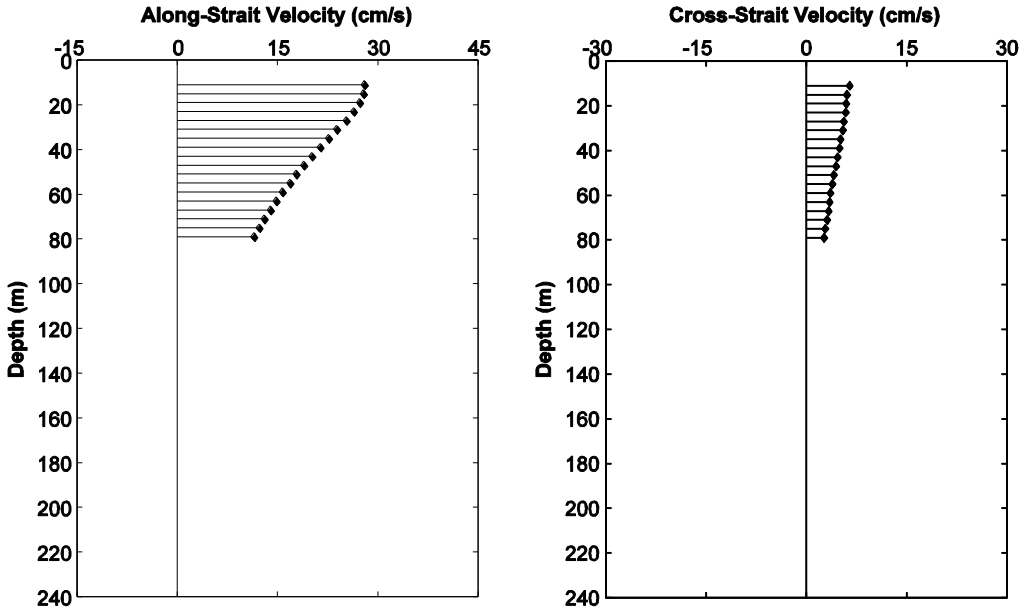
Figure 30: Mean Flows, Spring: Mar. 2007 to Jun. 2007 (continued).



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 31: Mean Flows, Early Summer: Jun. 2007 to Jul. 2007.

South side of Barrow Strait



South-Central Barrow Strait (WHADCP)

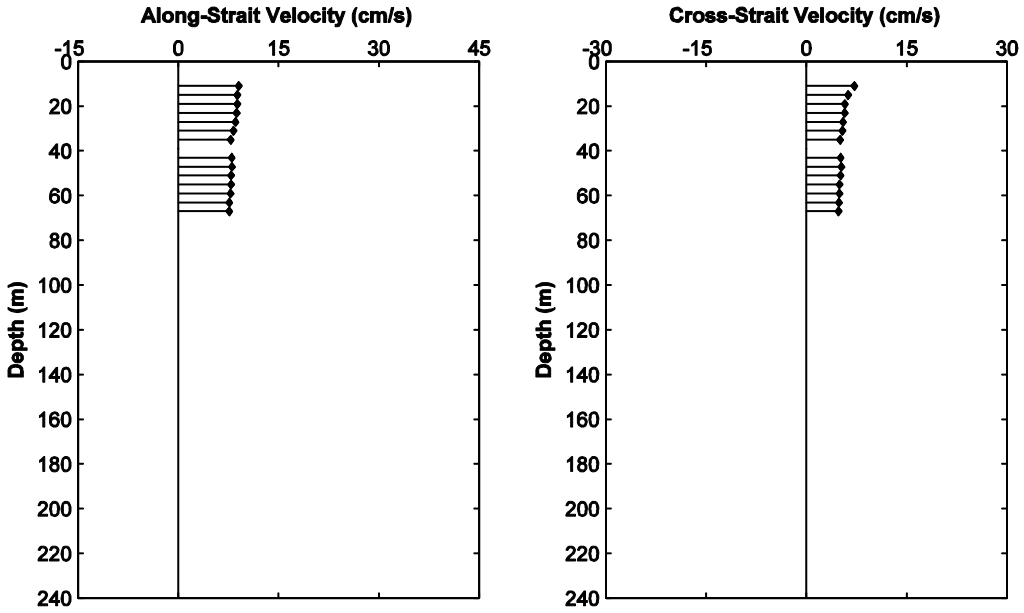
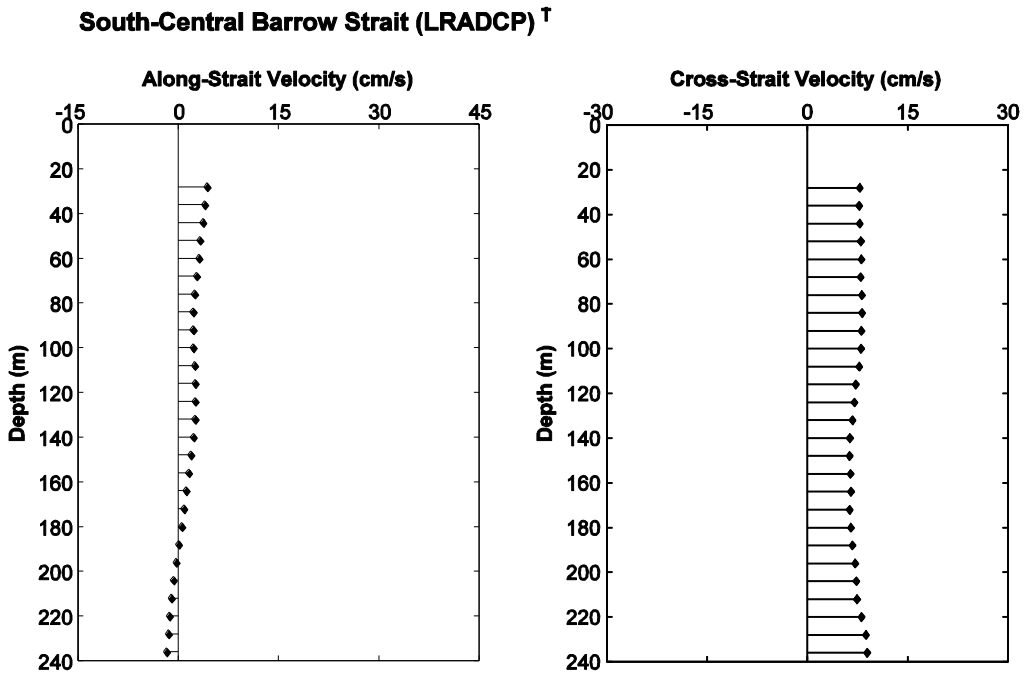


Figure 31: Mean Flows, Early Summer: Jun. 2007 to Jul. 2007 (continued).



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 32: Variance in bi-hourly and low-pass filtered currents. Aug. 2006 to Jul. 2007.

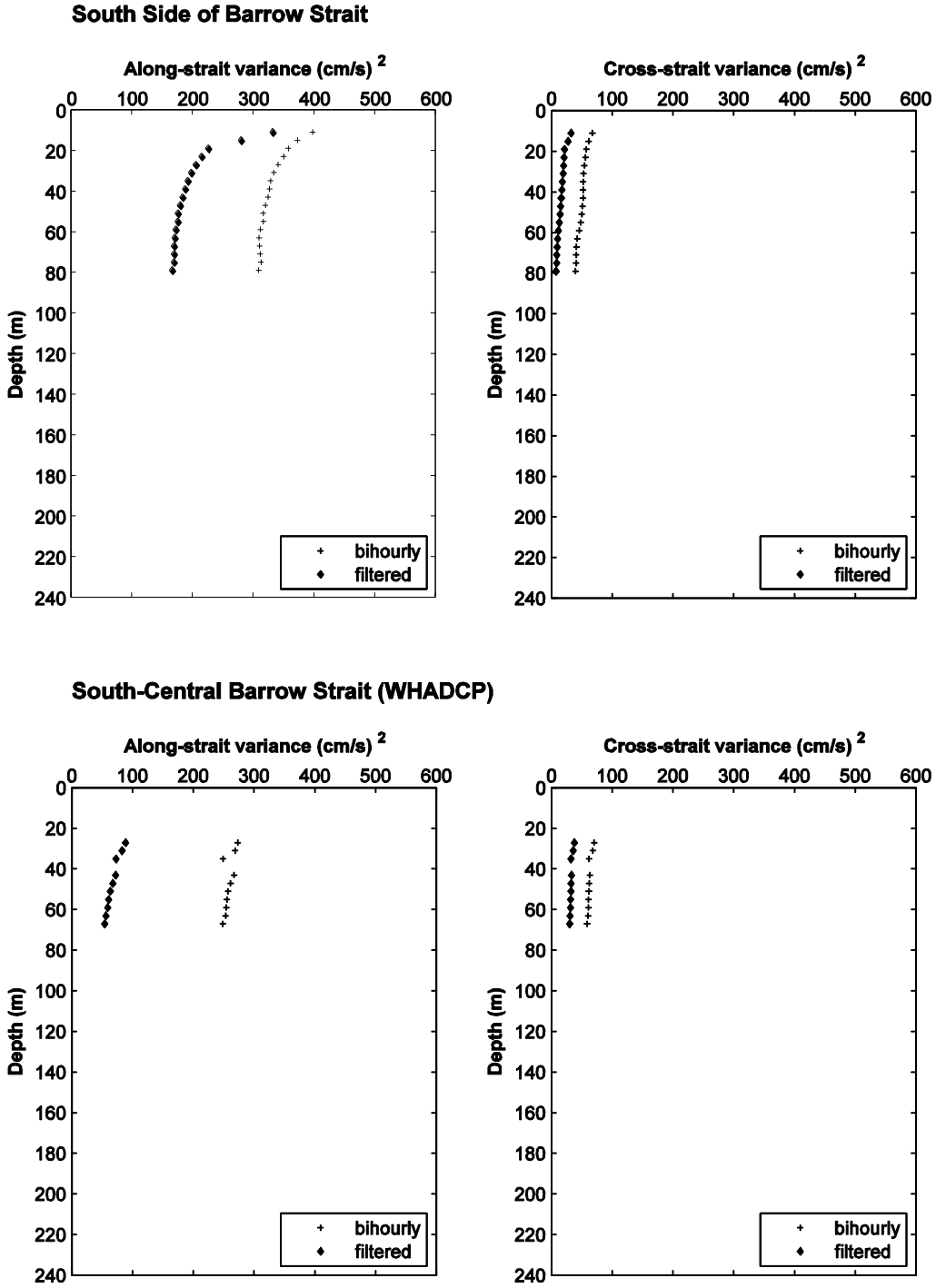
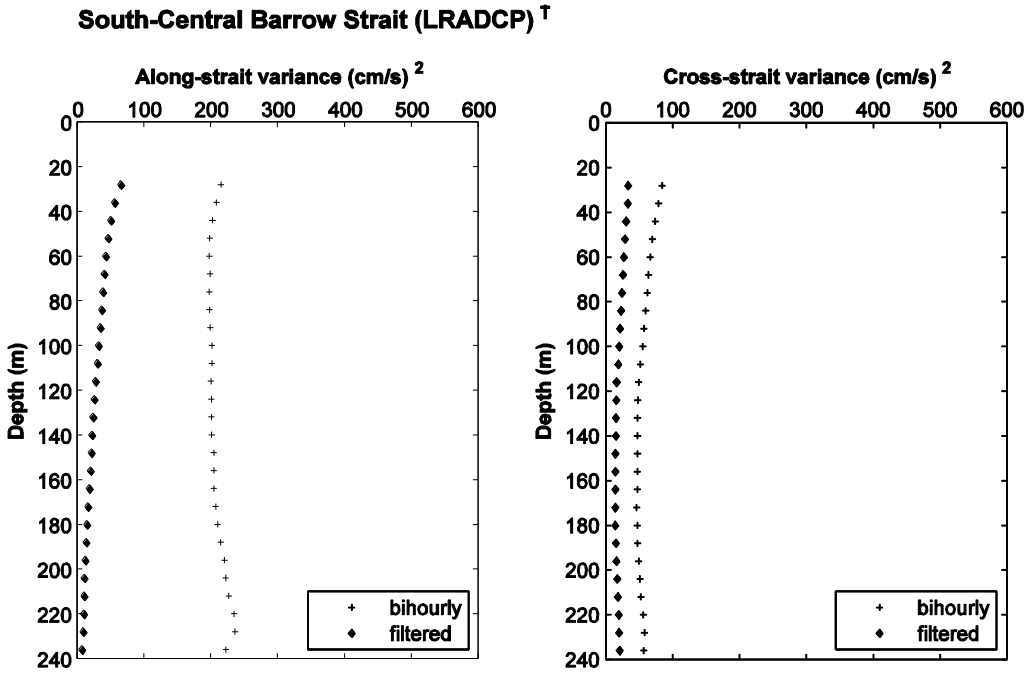


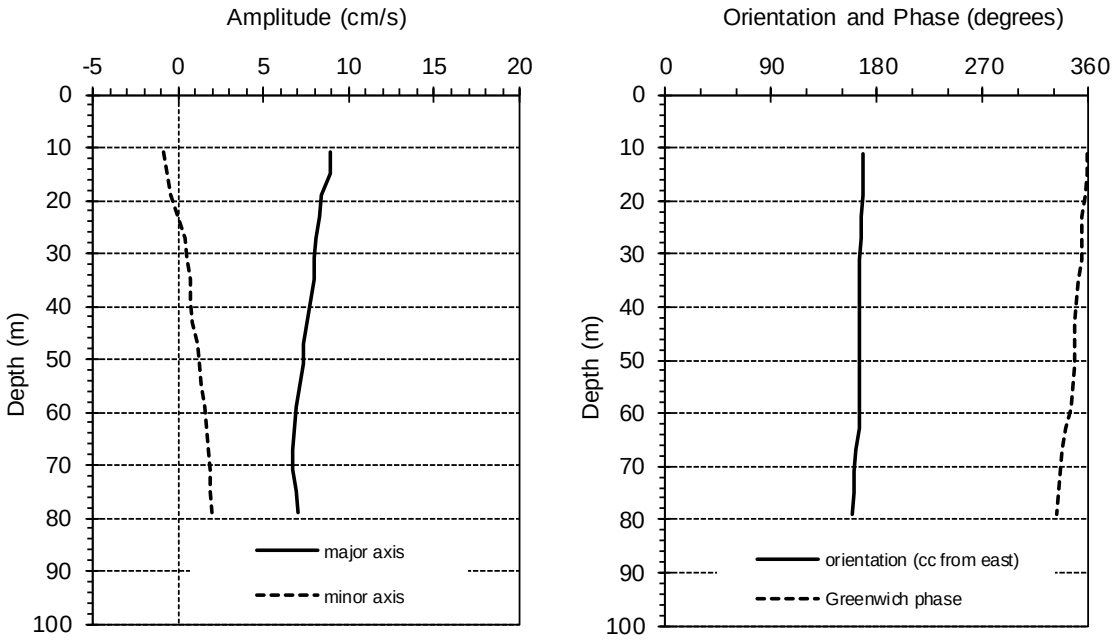
Figure 32: Variance in bi-hourly and low-pass filtered currents Aug. 2006 to Jul. 2007 (continued).



† Not corrected for error induced by instrument tilt after early December (see Fig. 8)

Figure 33: K1 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 5, 2006 to Nov. 2, 2006):



For Solid Ice Period (Mar. 3, 2007 to Jun. 12, 2007):

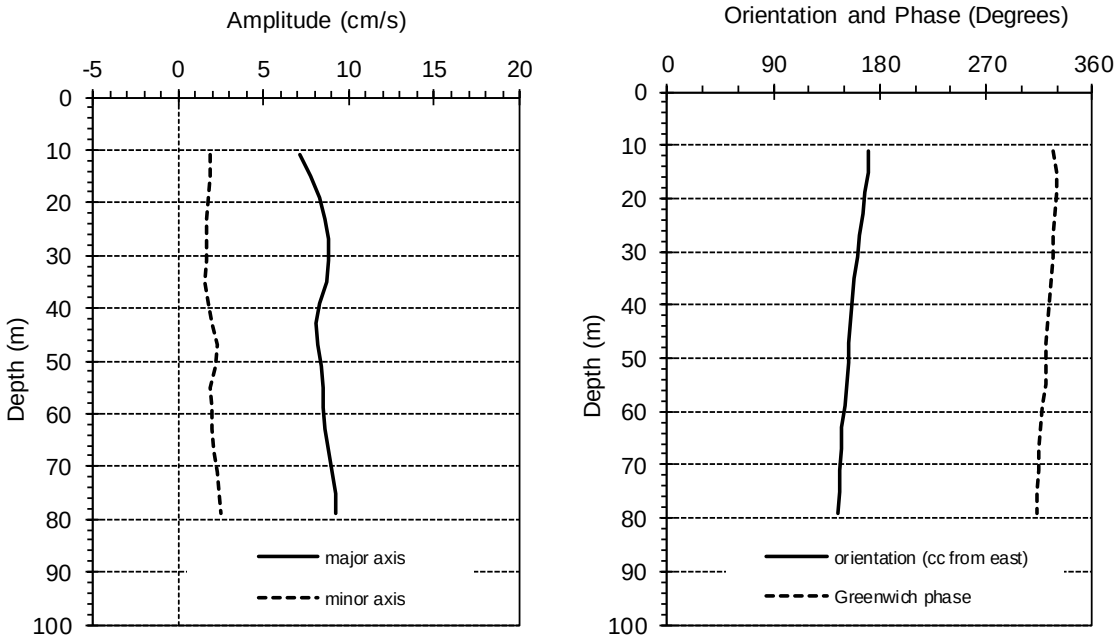
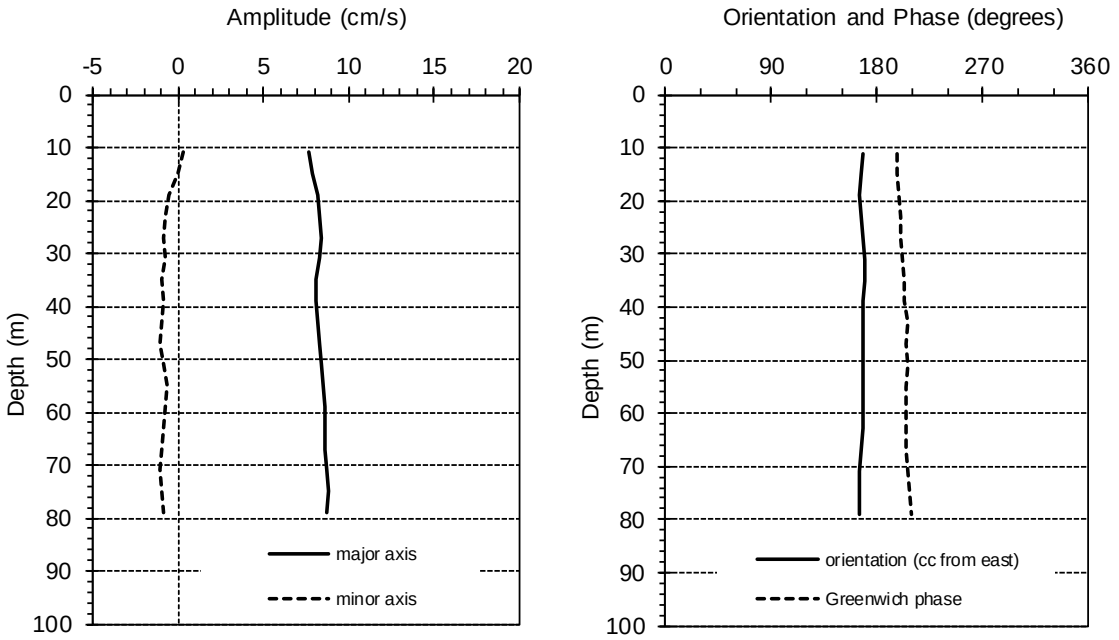


Figure 34: M2 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 5, 2006 to Nov. 2, 2006):



For Solid Ice Period (Mar. 3, 2007 to Jun. 12, 2007):

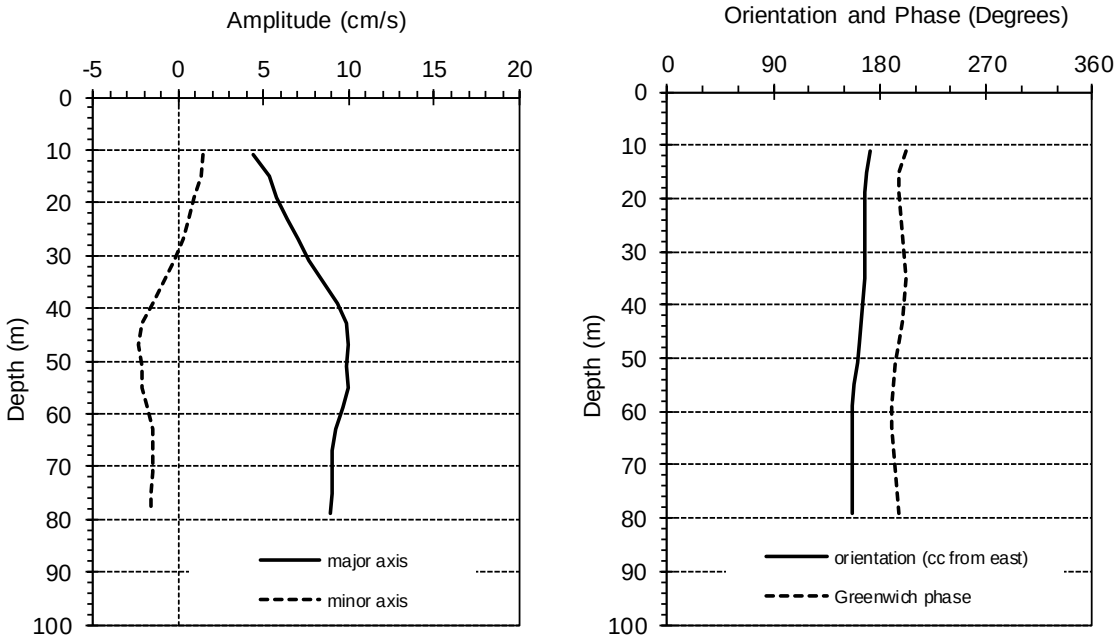
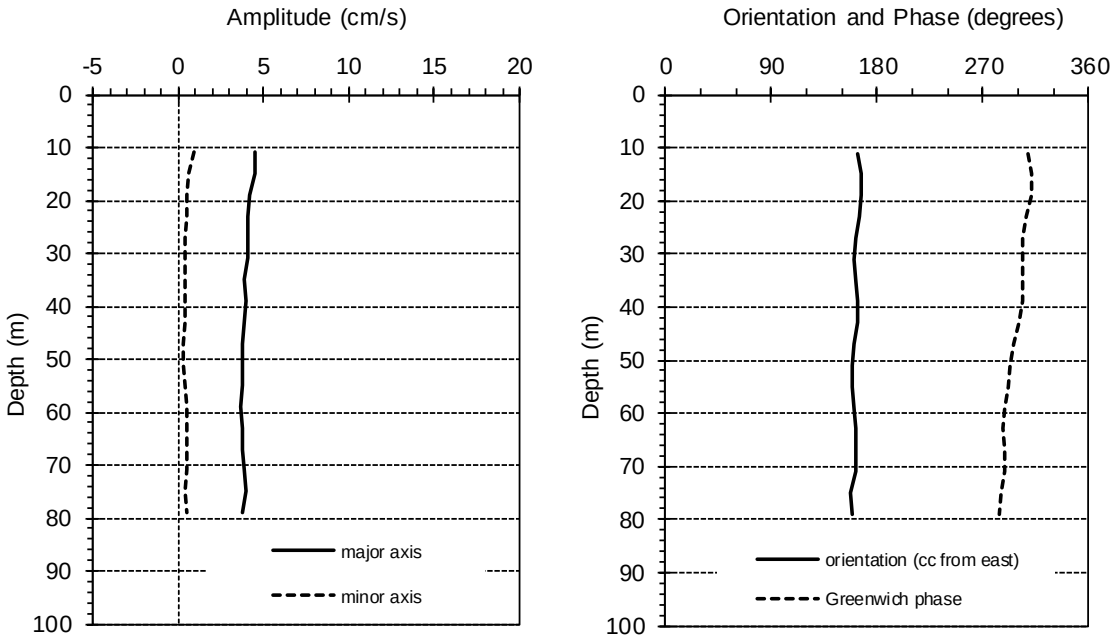


Figure 35: O1 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 5, 2006 to Nov. 2, 2006):



For Solid Ice Period (Mar. 3, 2007 to Jun. 12, 2007):

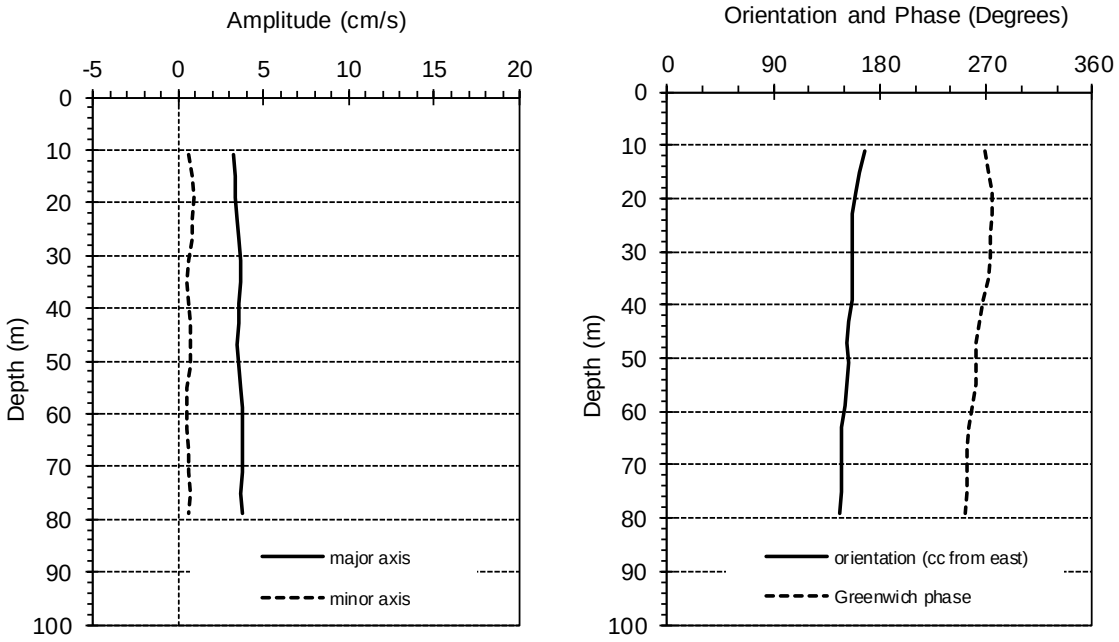
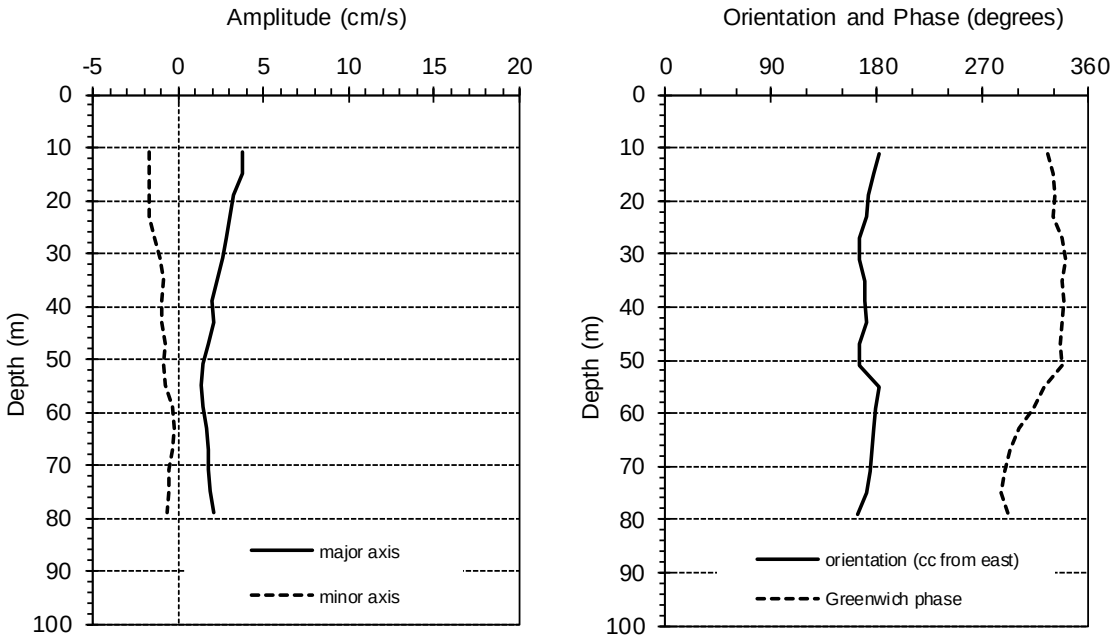


Figure 36: P1 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 5, 2006 to Nov. 2, 2006):



For Solid Ice Period (Mar. 3, 2007 to Jun. 12, 2007):

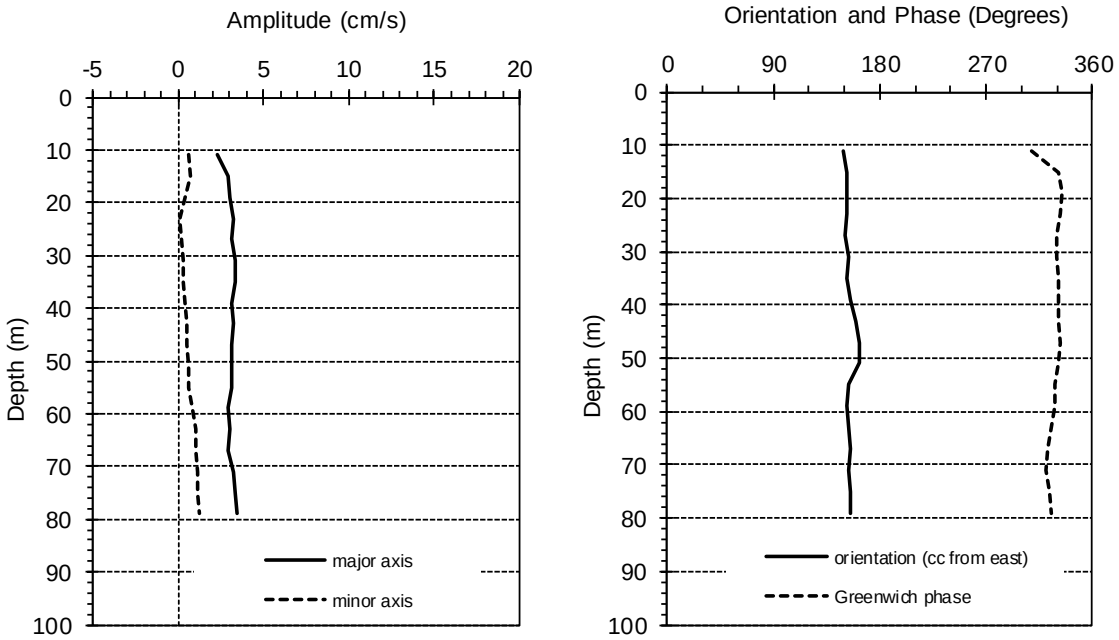
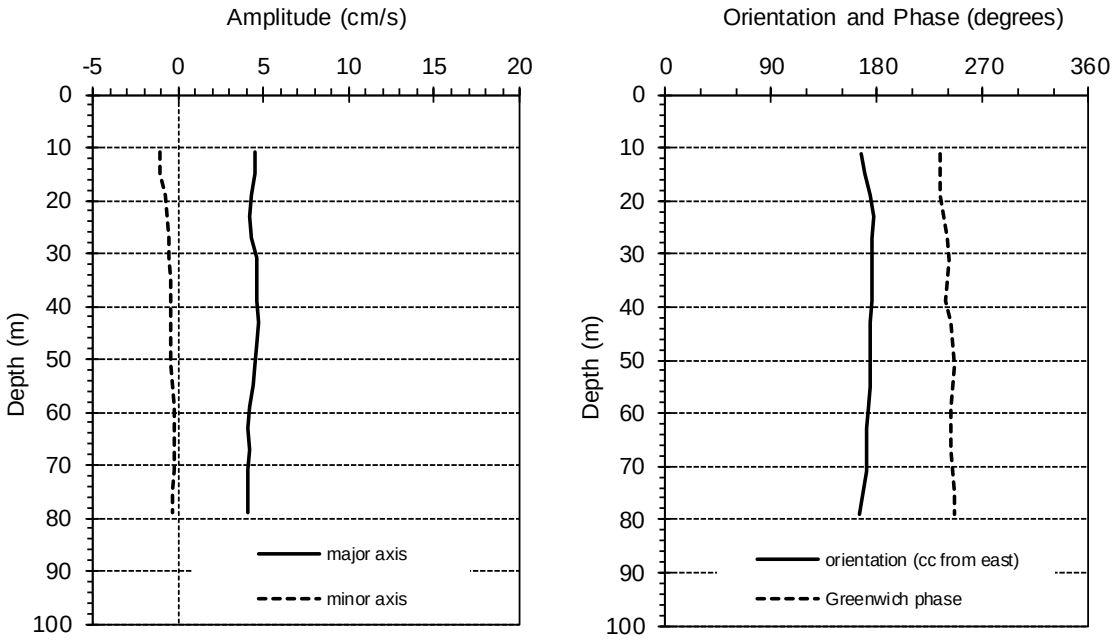


Figure 37: S2 Tidal Constituent, South Side of Barrow Strait

For Ice Free Period (Aug. 5, 2006 to Nov. 2, 2006):



For Solid Ice Period (Mar. 3, 2007 to Jun. 12, 2007):

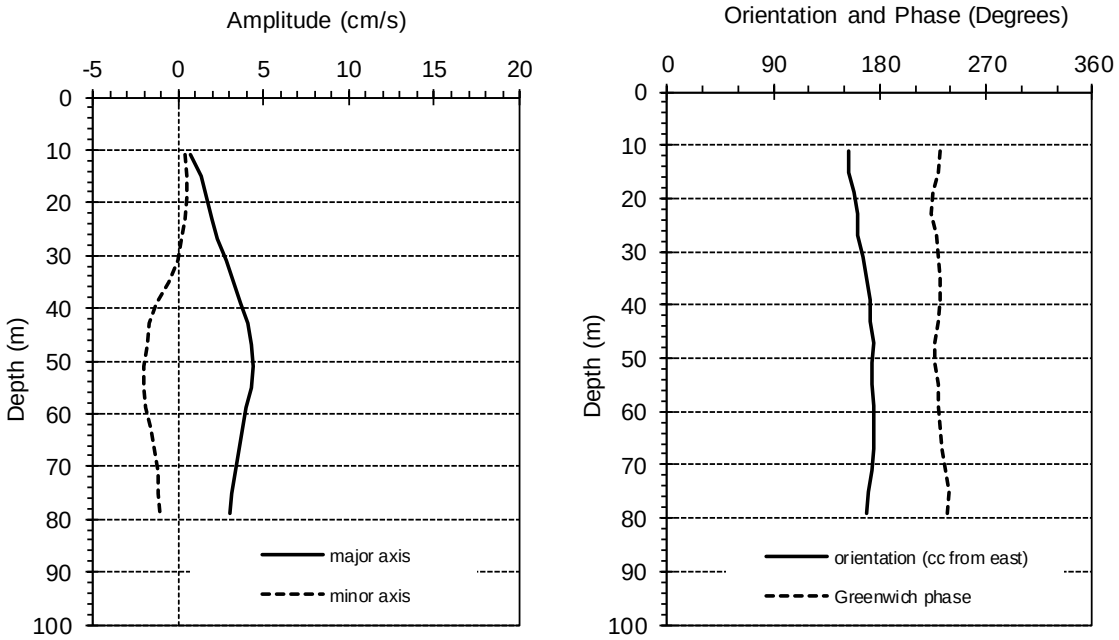
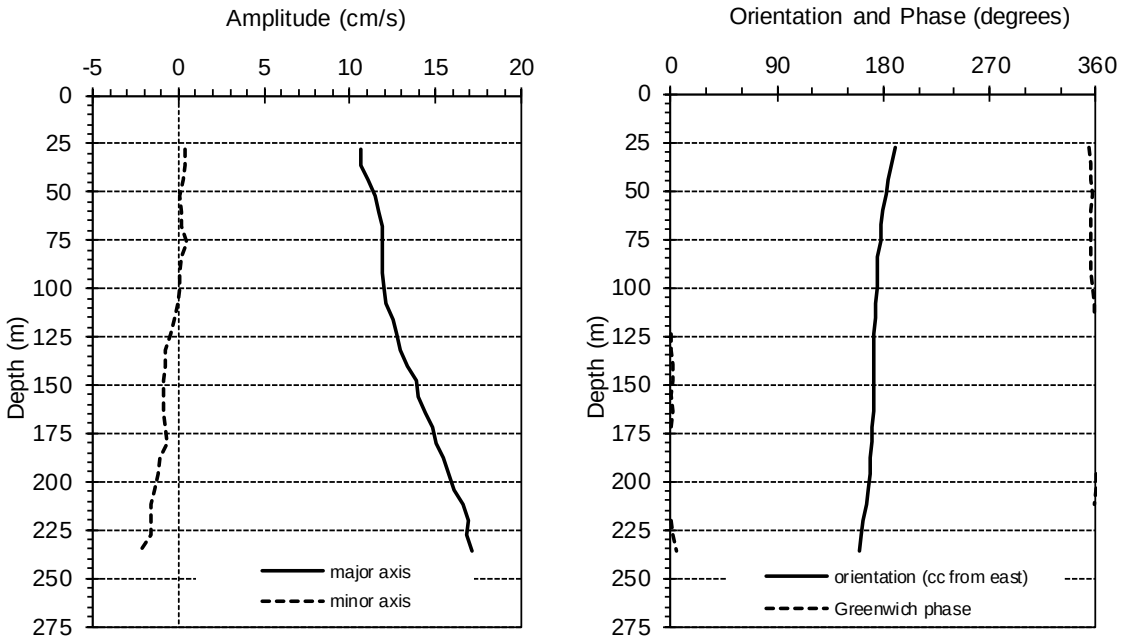


Figure 38: K1 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 to Nov. 4, 2006):



For Solid Ice Period

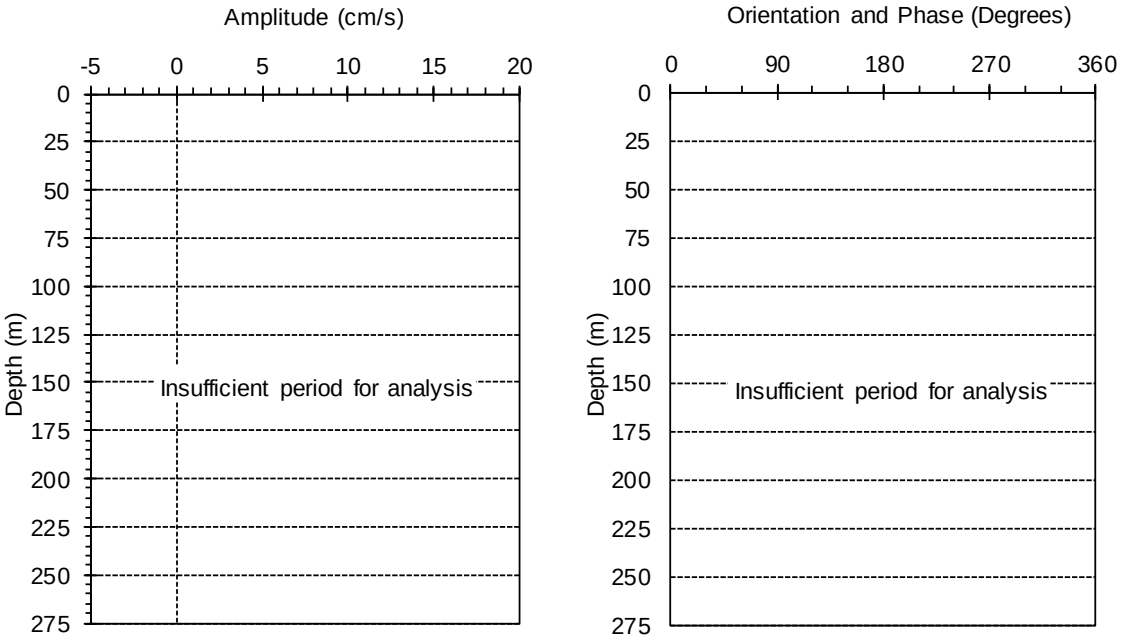
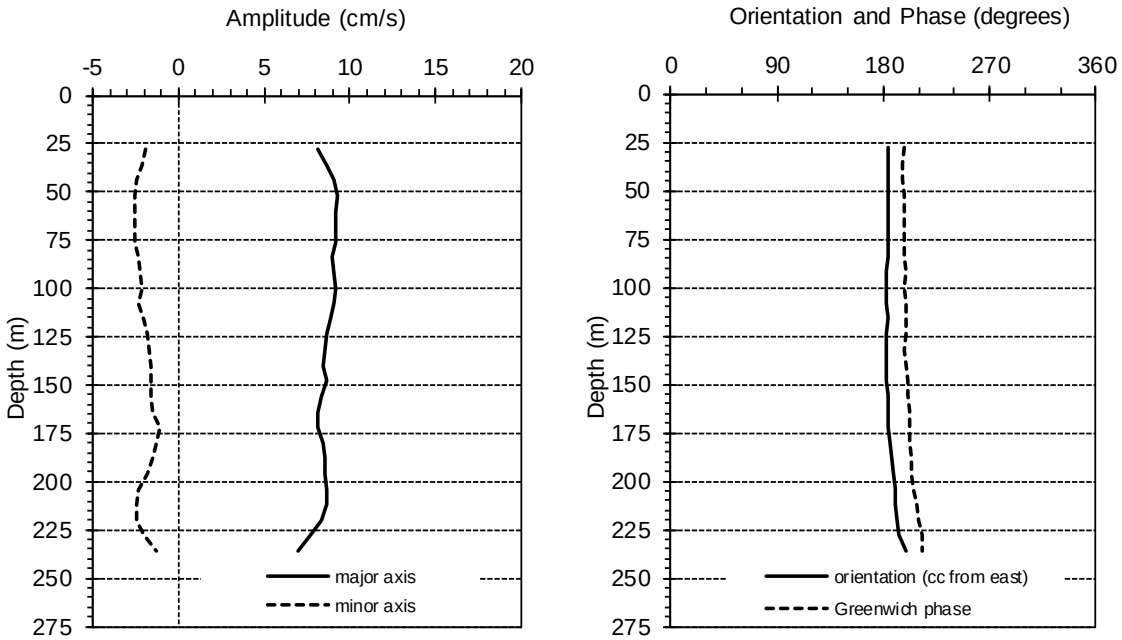


Figure 39: M2 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 to Nov. 4, 2006):



For Solid Ice Period

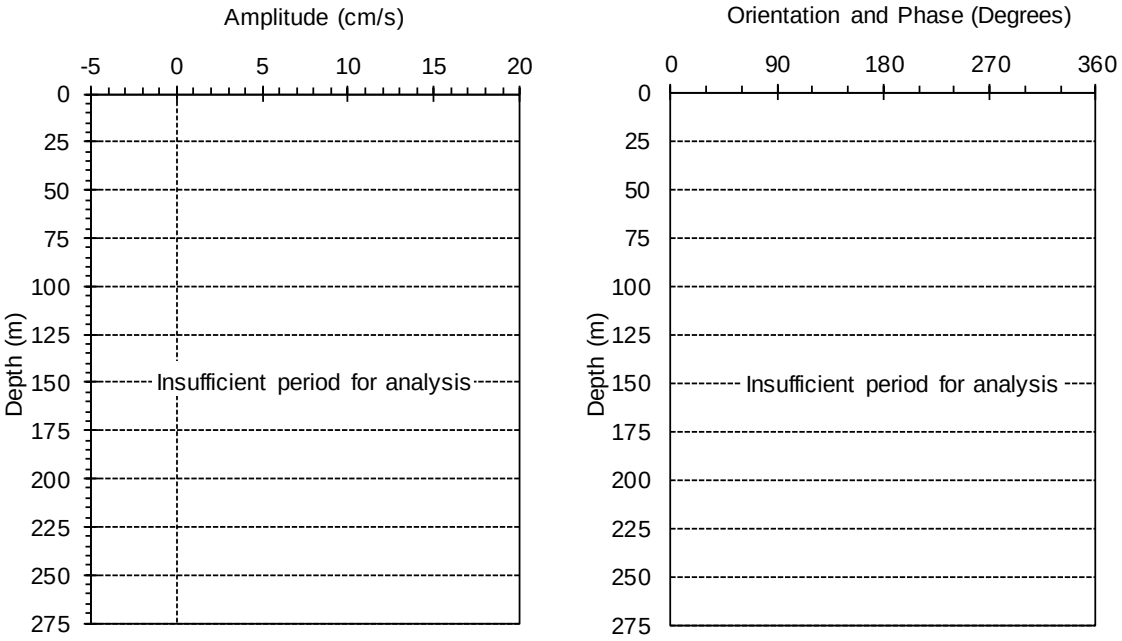
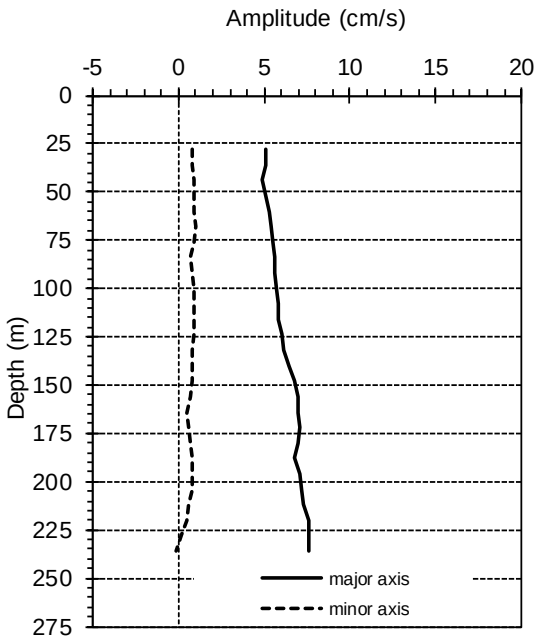
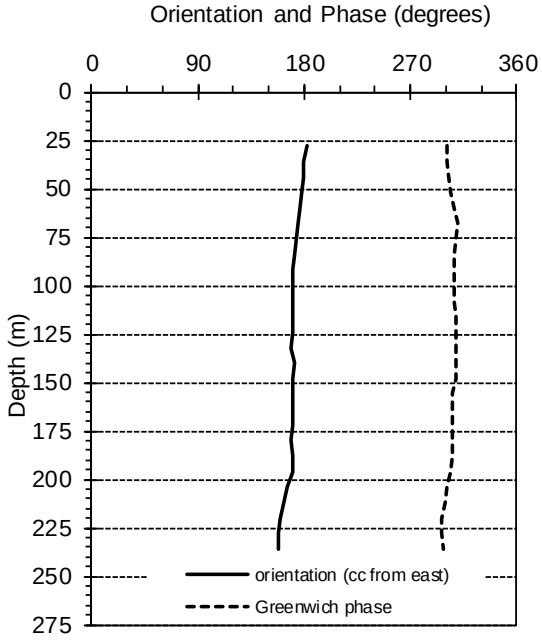


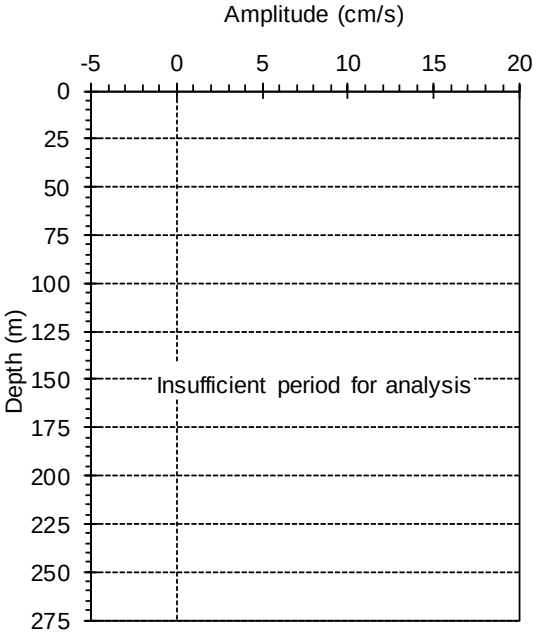
Figure 40: O1 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 to Nov. 4, 2006):





For Solid Ice Period



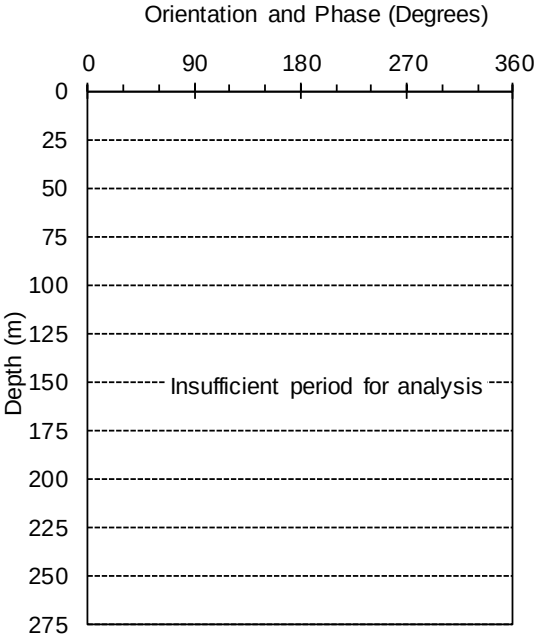
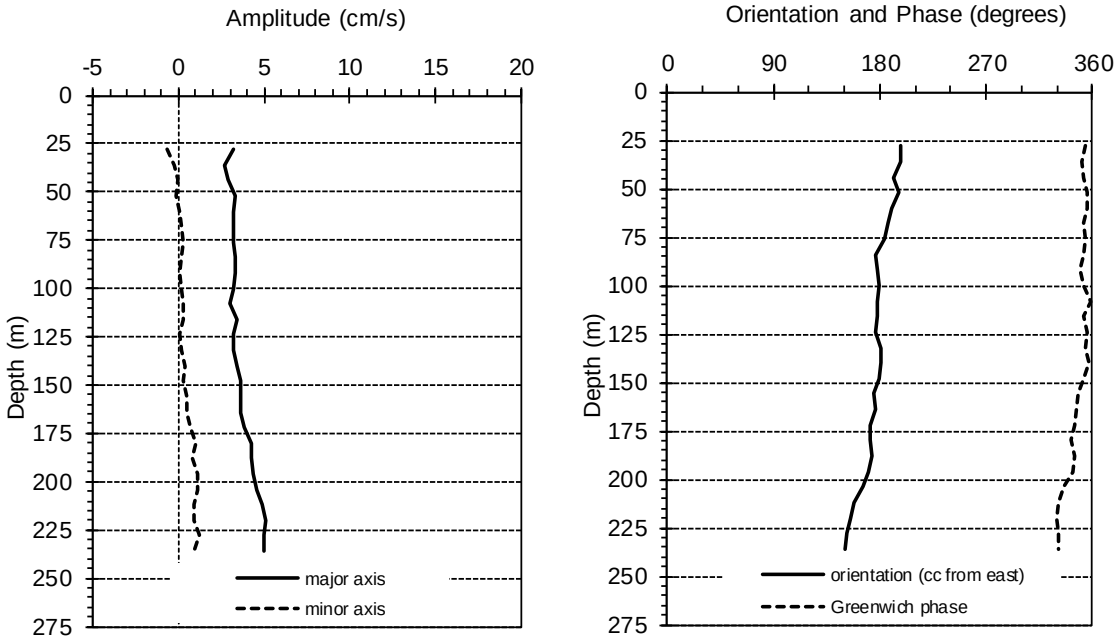


Figure 41: P1 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 to Nov. 4, 2006):



For Solid Ice Period

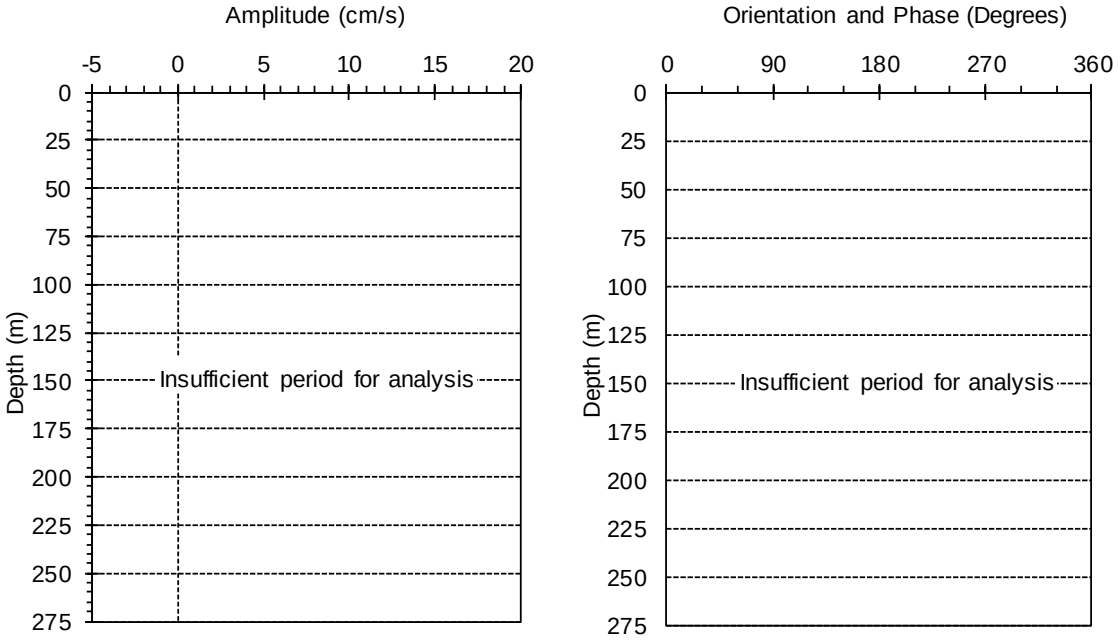
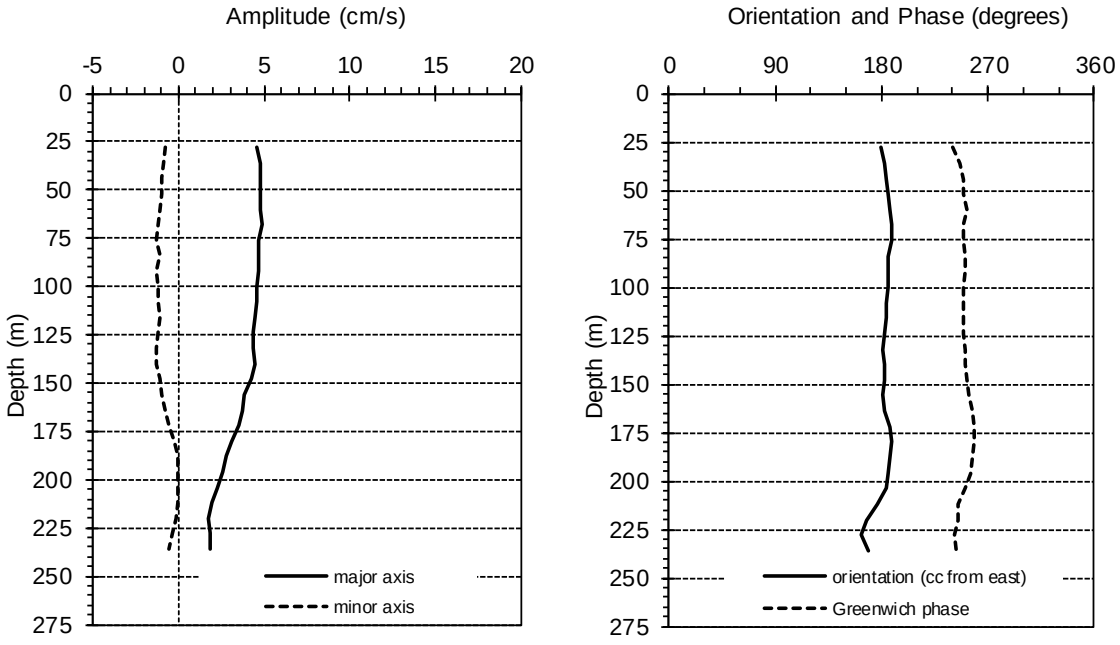


Figure 42: S2 Tidal Constituent, South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 to Nov. 4, 2006):



For Solid Ice Period

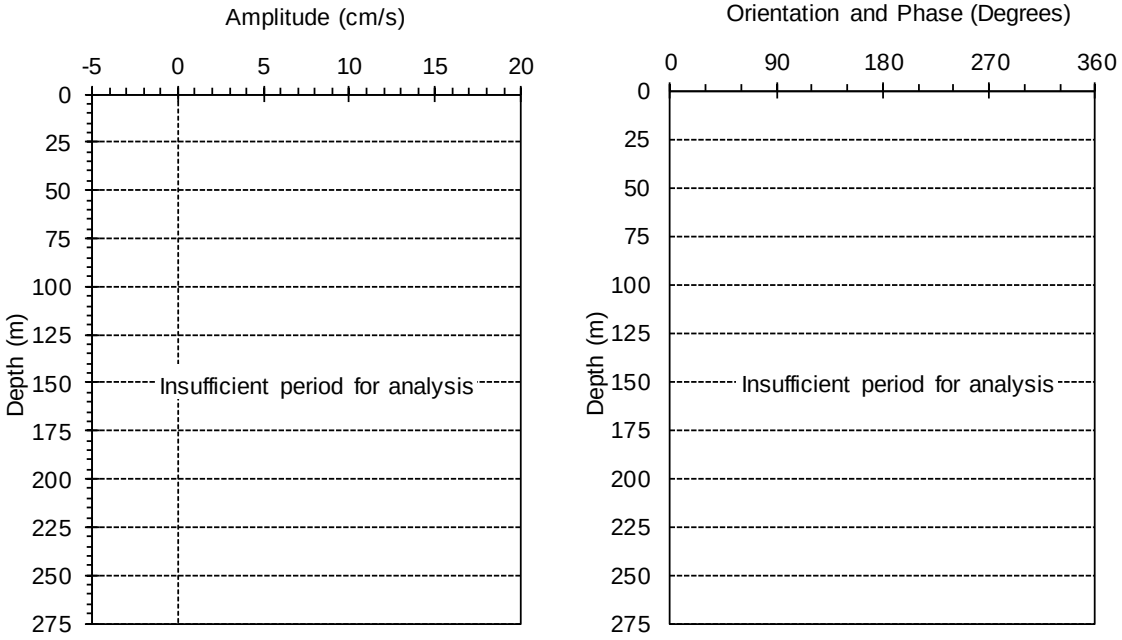
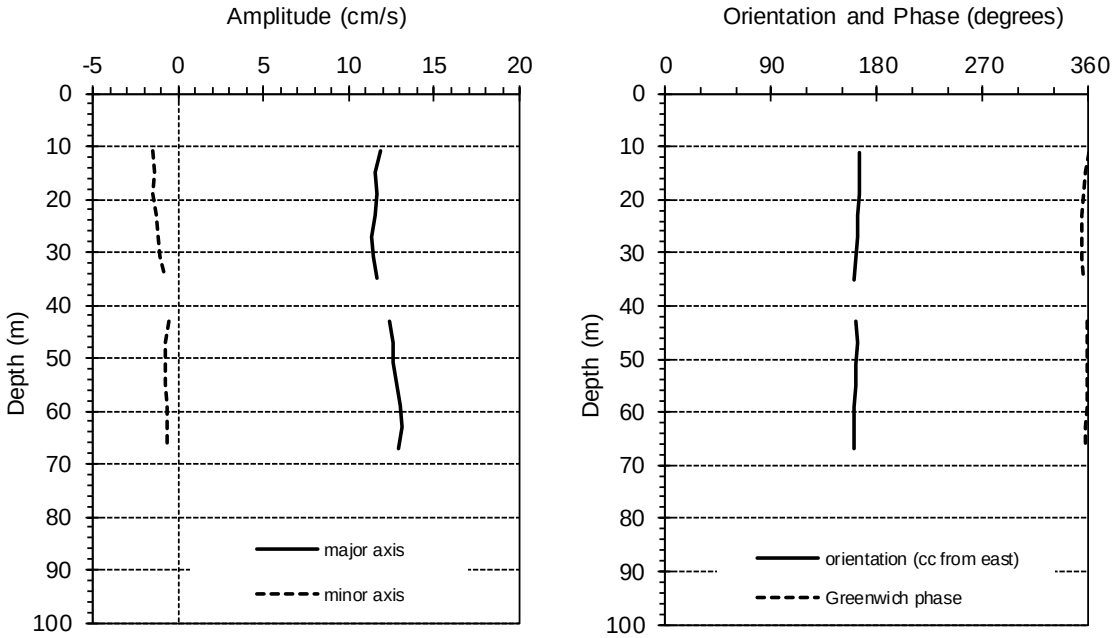


Figure 43: K1 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 05, 2006 to Nov. 4, 2006):



For Solid Ice Period

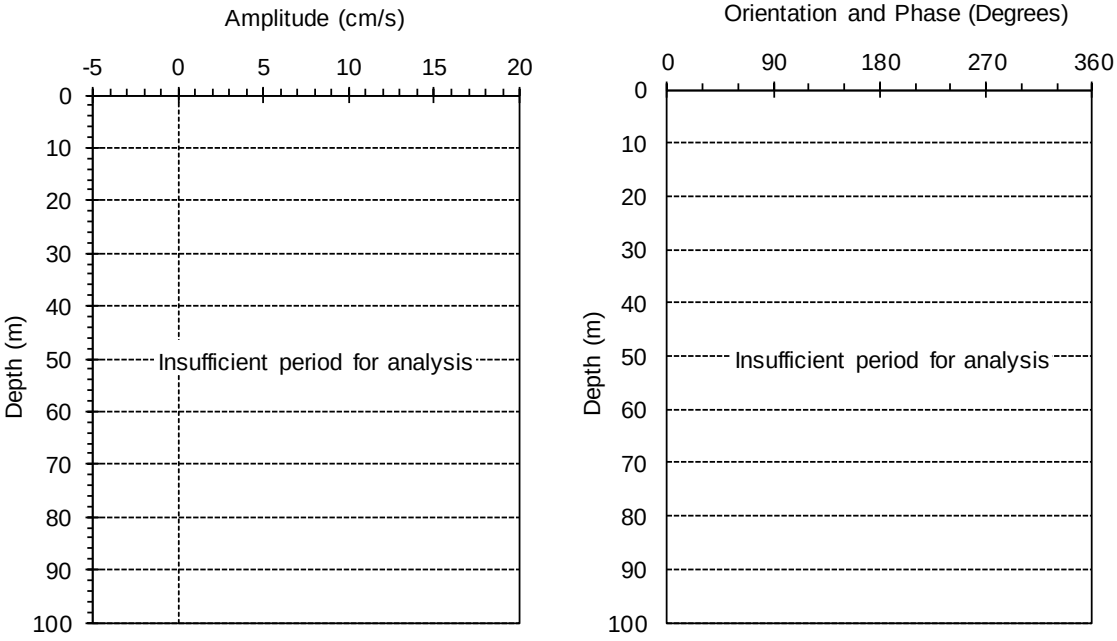
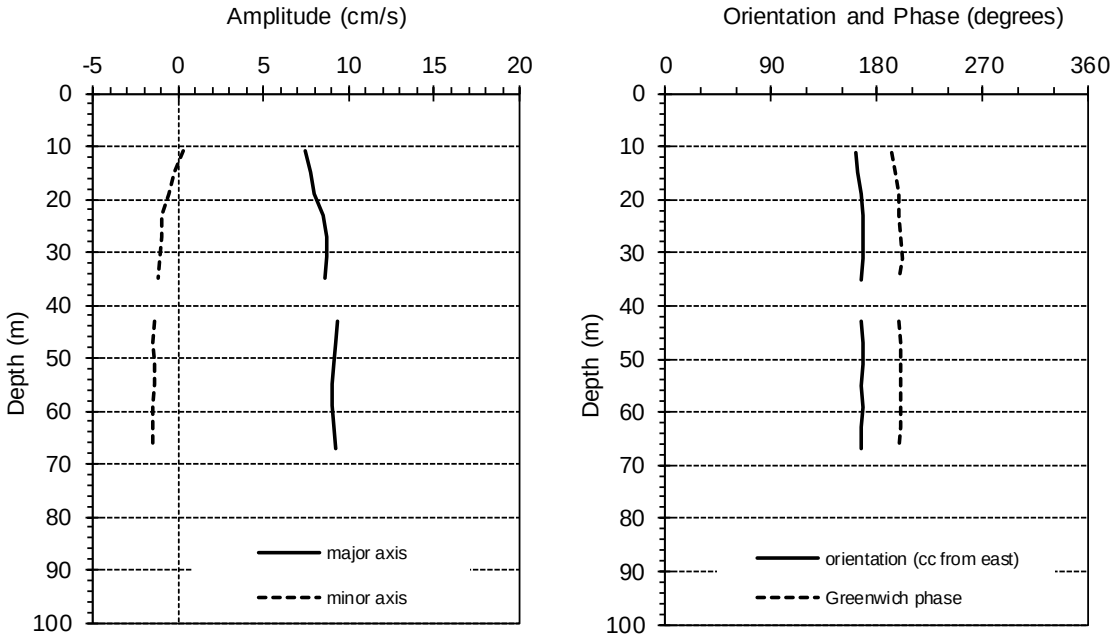


Figure 44: M2 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 05, 2006 to Nov. 4, 2006):



For Solid Ice Period

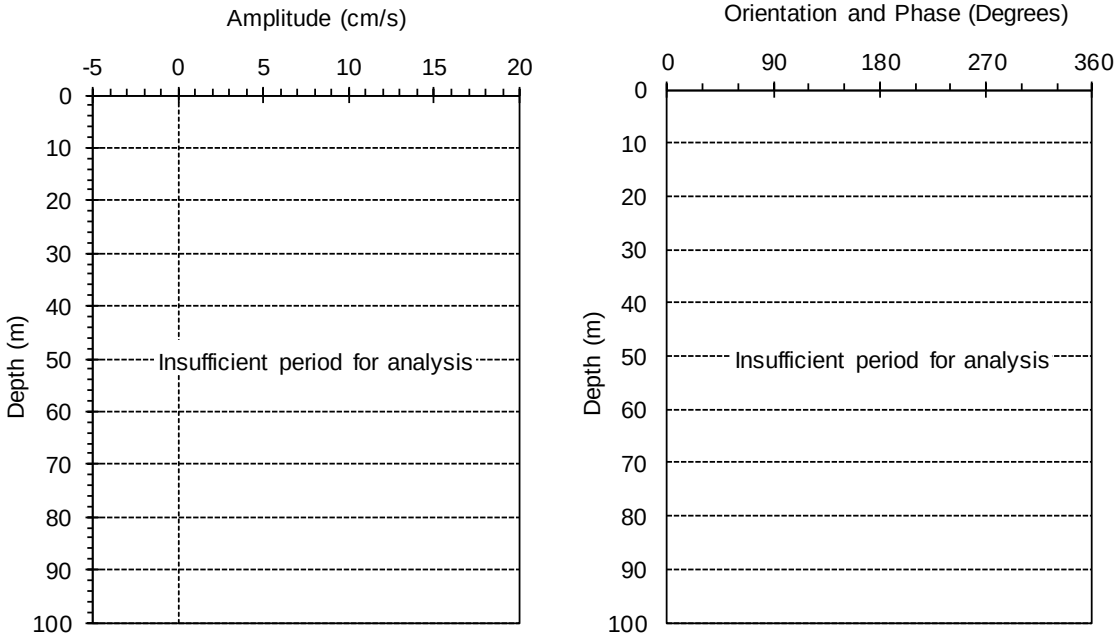
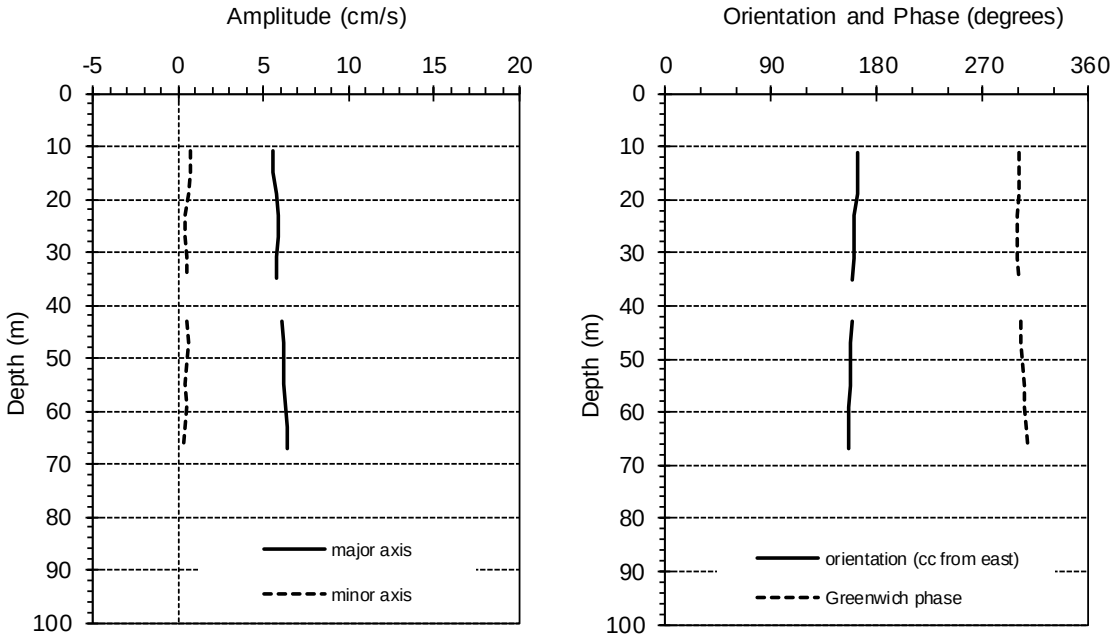


Figure 45: O1 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 5, 2006 to Nov. 4, 2006):



For Solid Ice Period

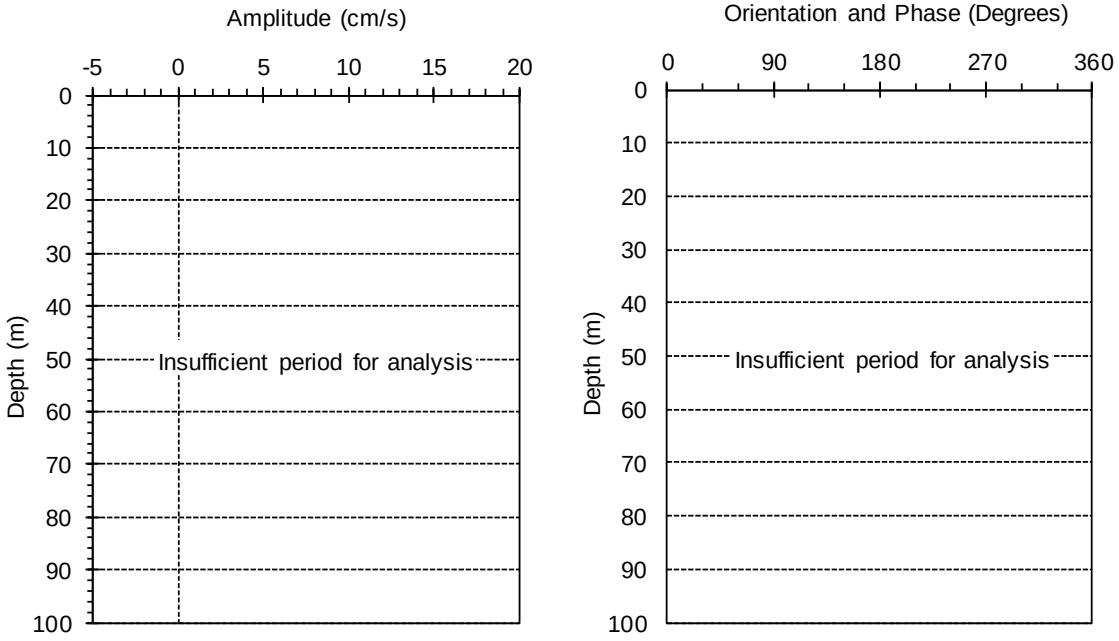
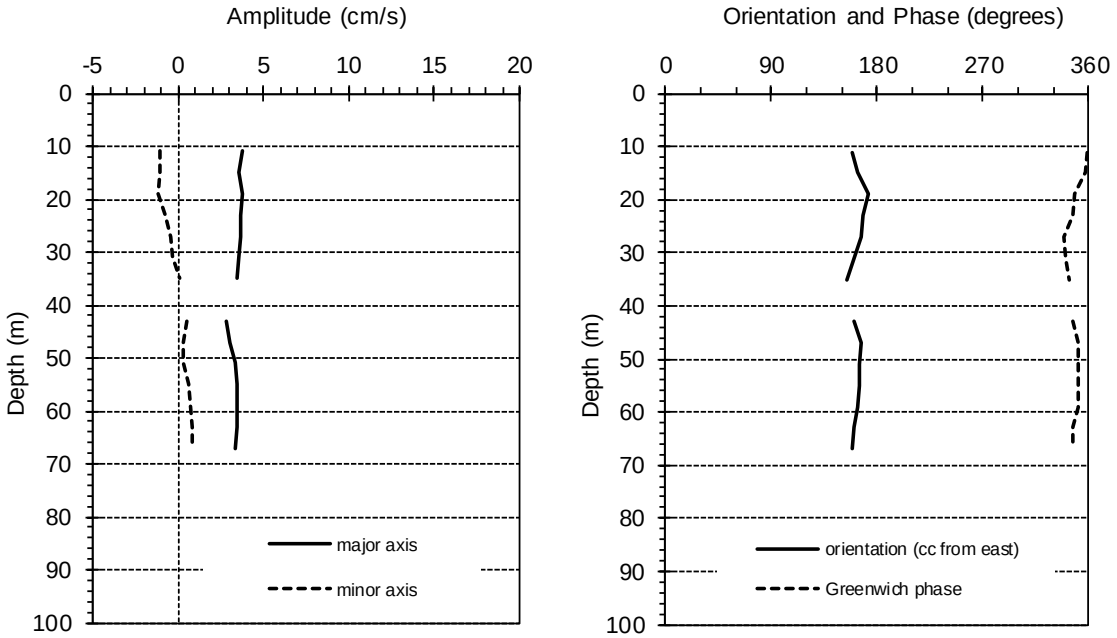


Figure 46: P1 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 5, 2006 to Nov. 4, 2006):



For Solid Ice Period

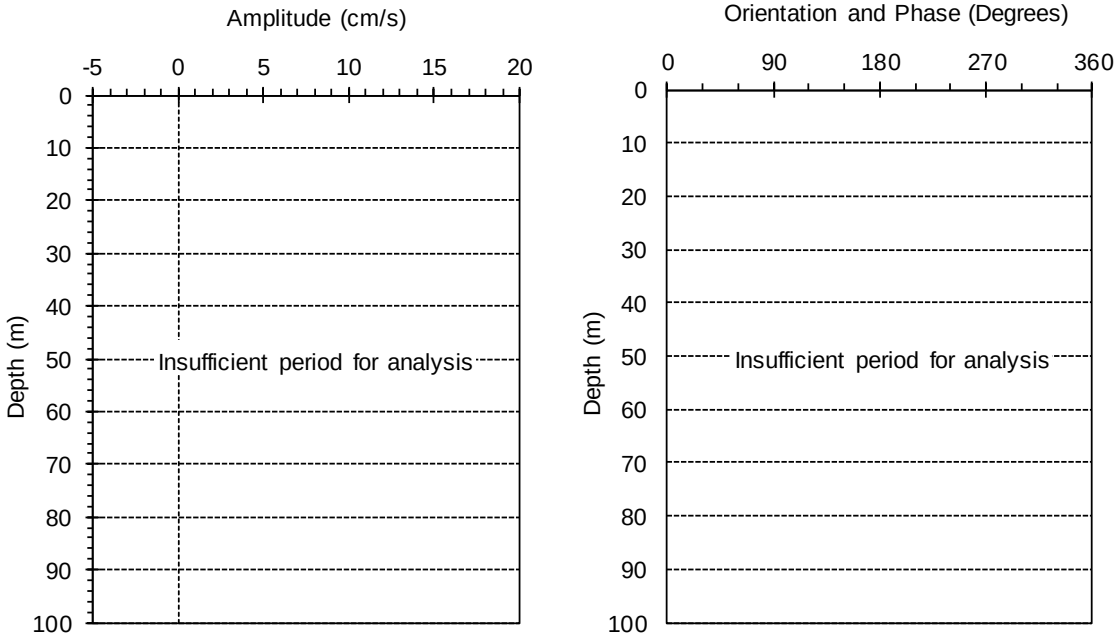
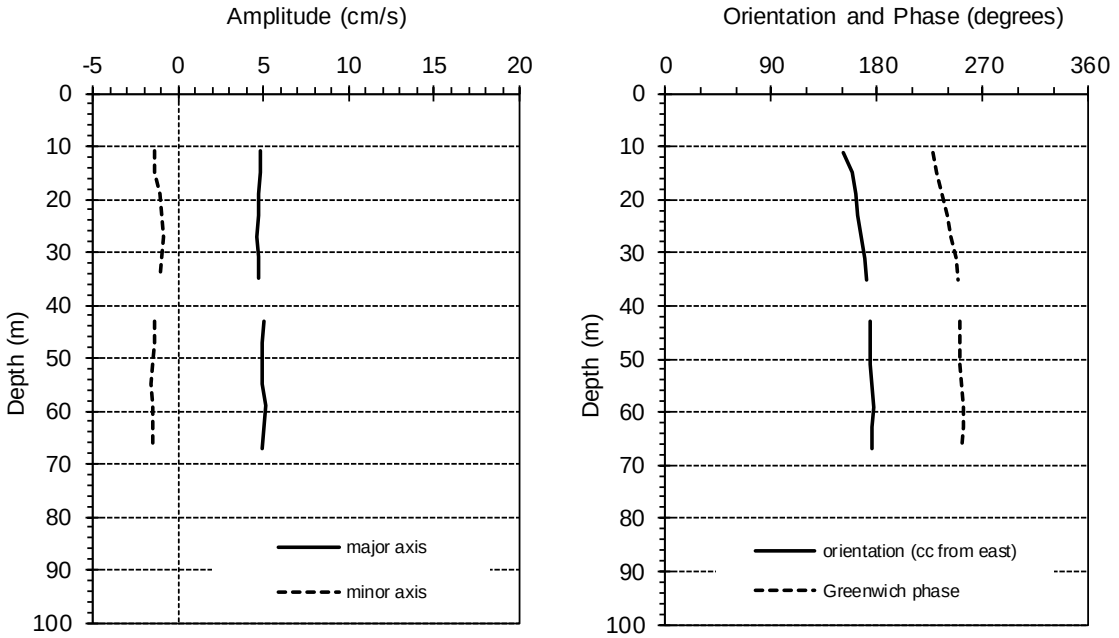


Figure 47: S2 Tidal Constituent, South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 5, 2006 to Nov. 4, 2006):



For Solid Ice Period

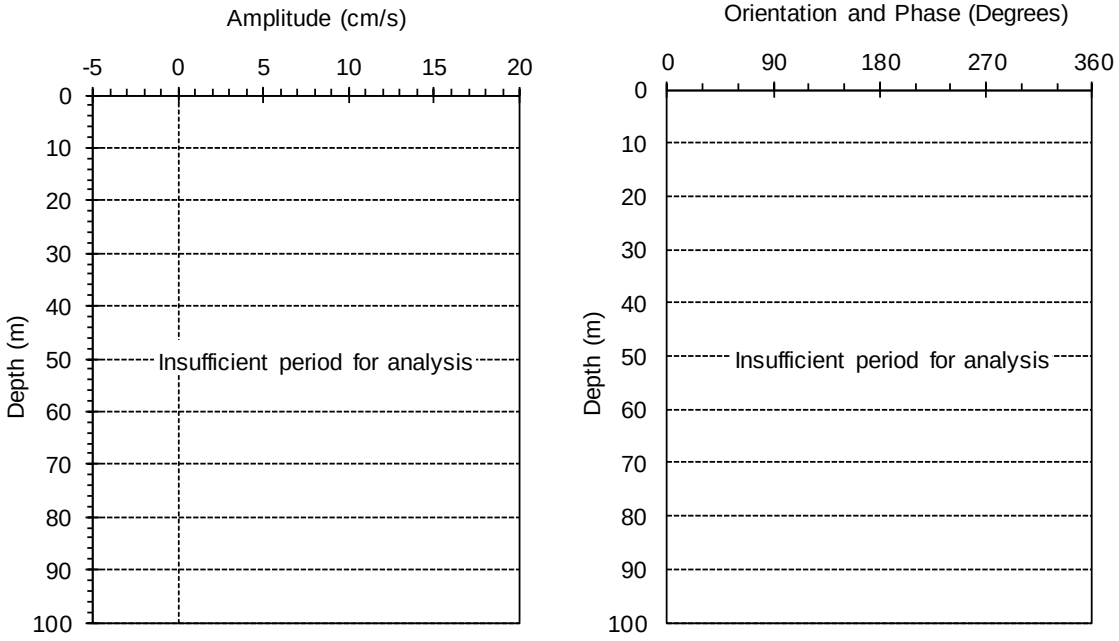


Figure 48: Ice velocity data, South side of Barrow Strait
August 2006 – July 2007

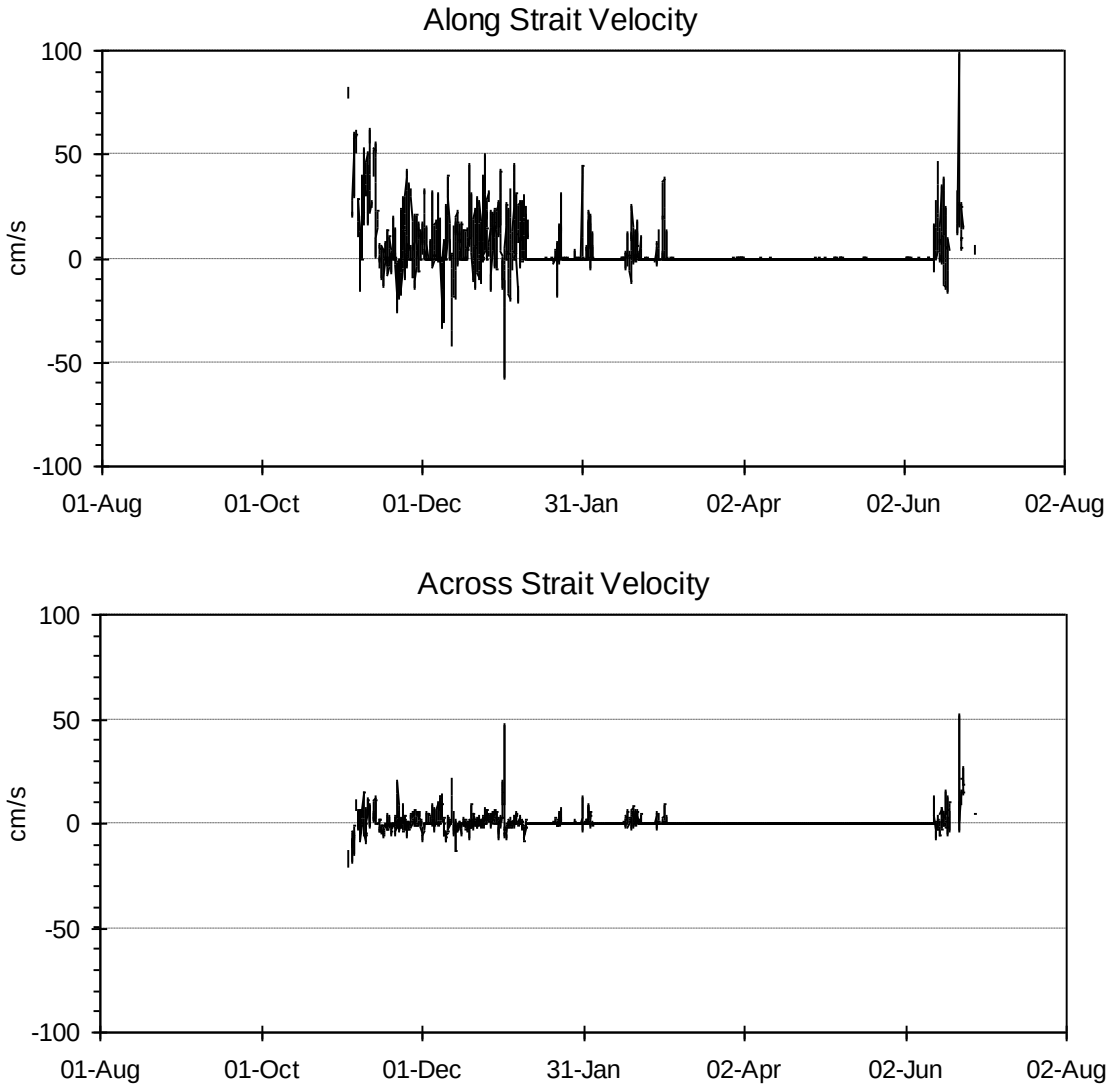


Figure 49: Ice velocity data, South-Central Barrow Strait (Workhorse ADCP) August 2006 – July 2007

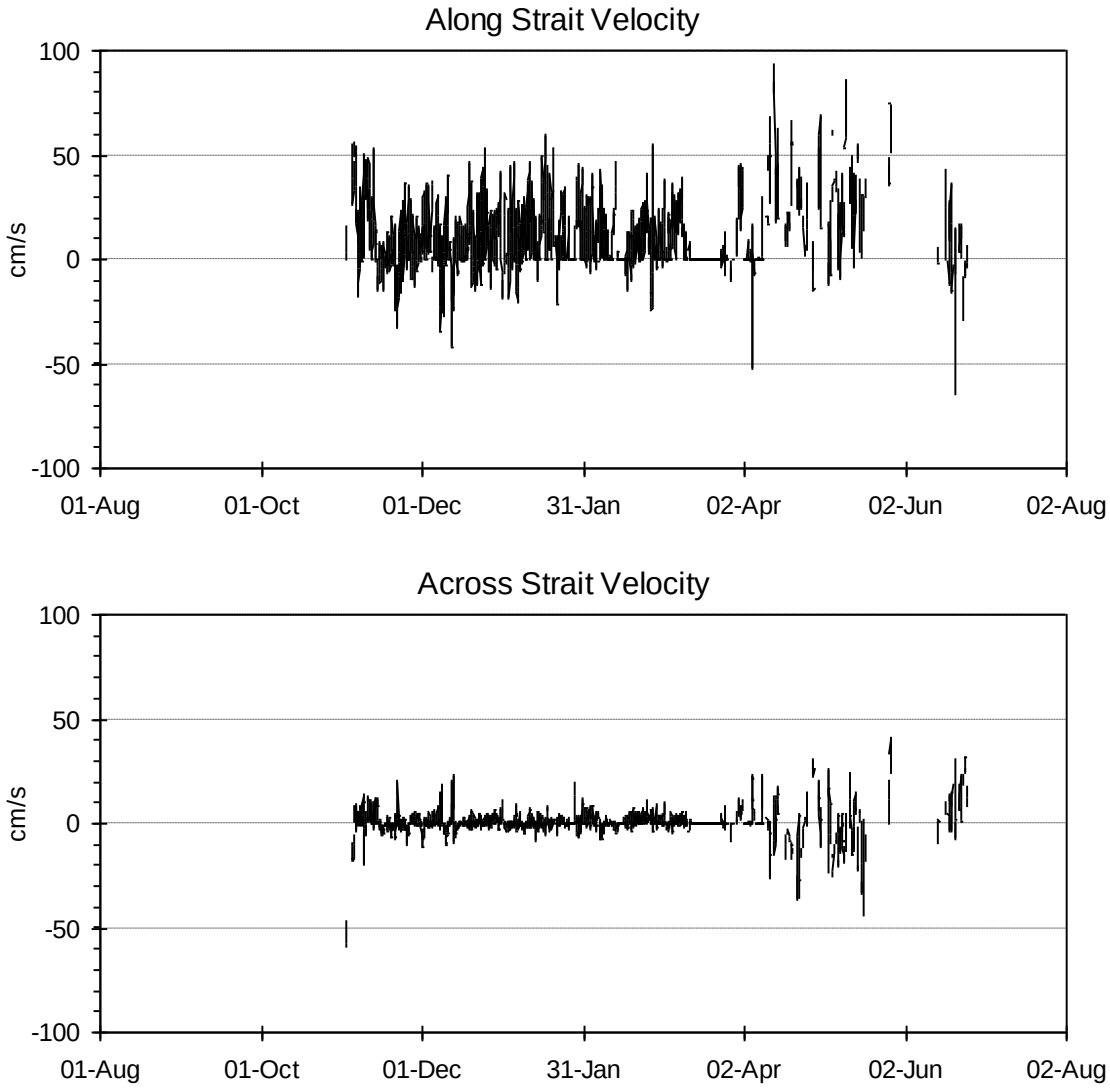
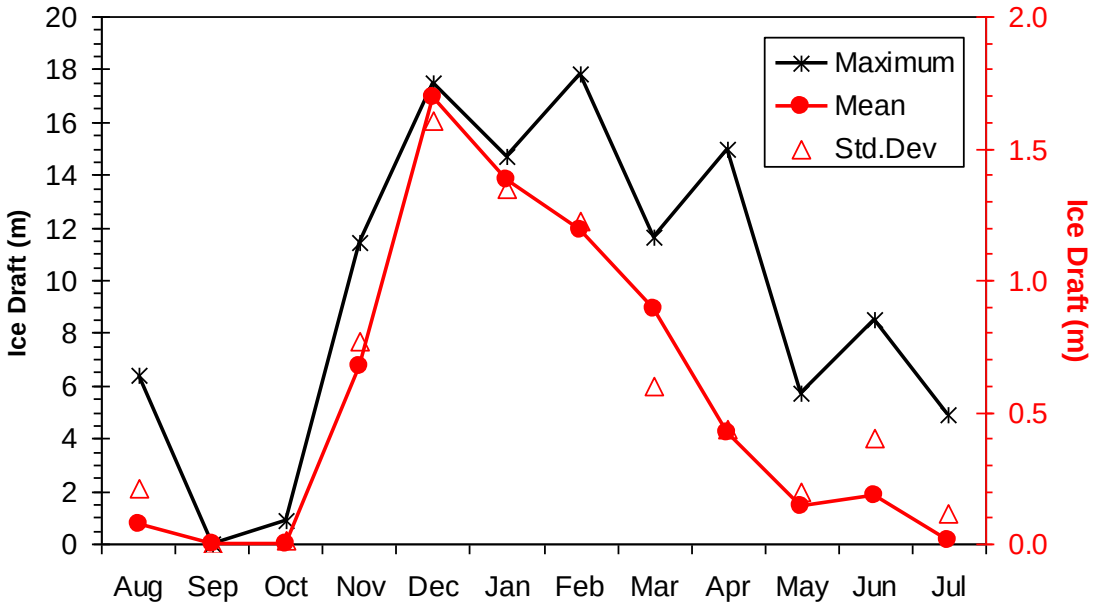


Figure 50: Ice Draft Statistics from Ice Profiling Sonar
South-Central Barrow Strait, August 2006 – July 2007



<u>Figure 51</u>: Frequency of Occurrence vs. Ice Draft in meters
South-Central Barrow Strait, August 2006 – July 2007
(For infrequent occurrences of large ice drafts, see Table 20)

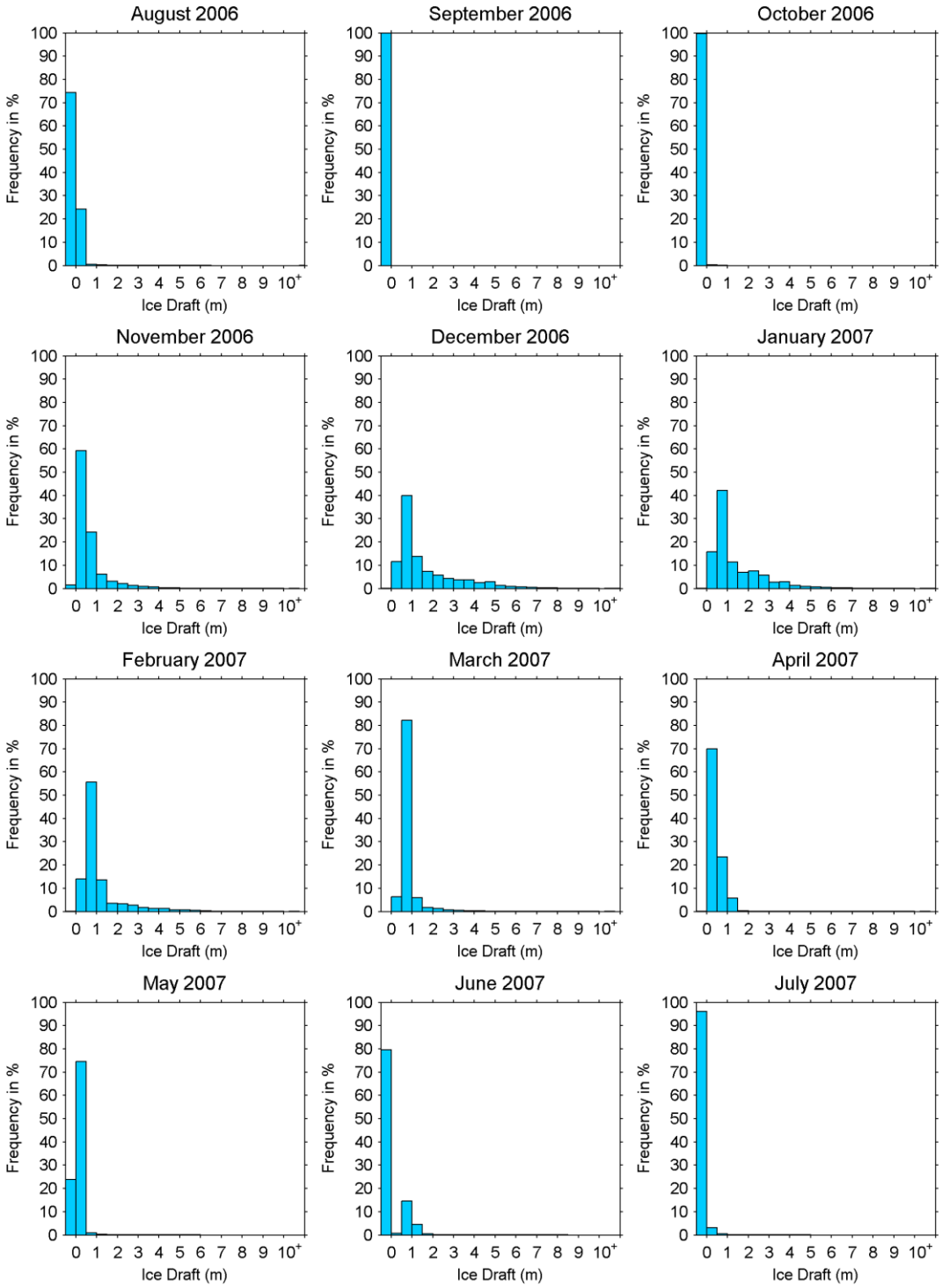


Figure 52: - CTD Station Positions, August 2007

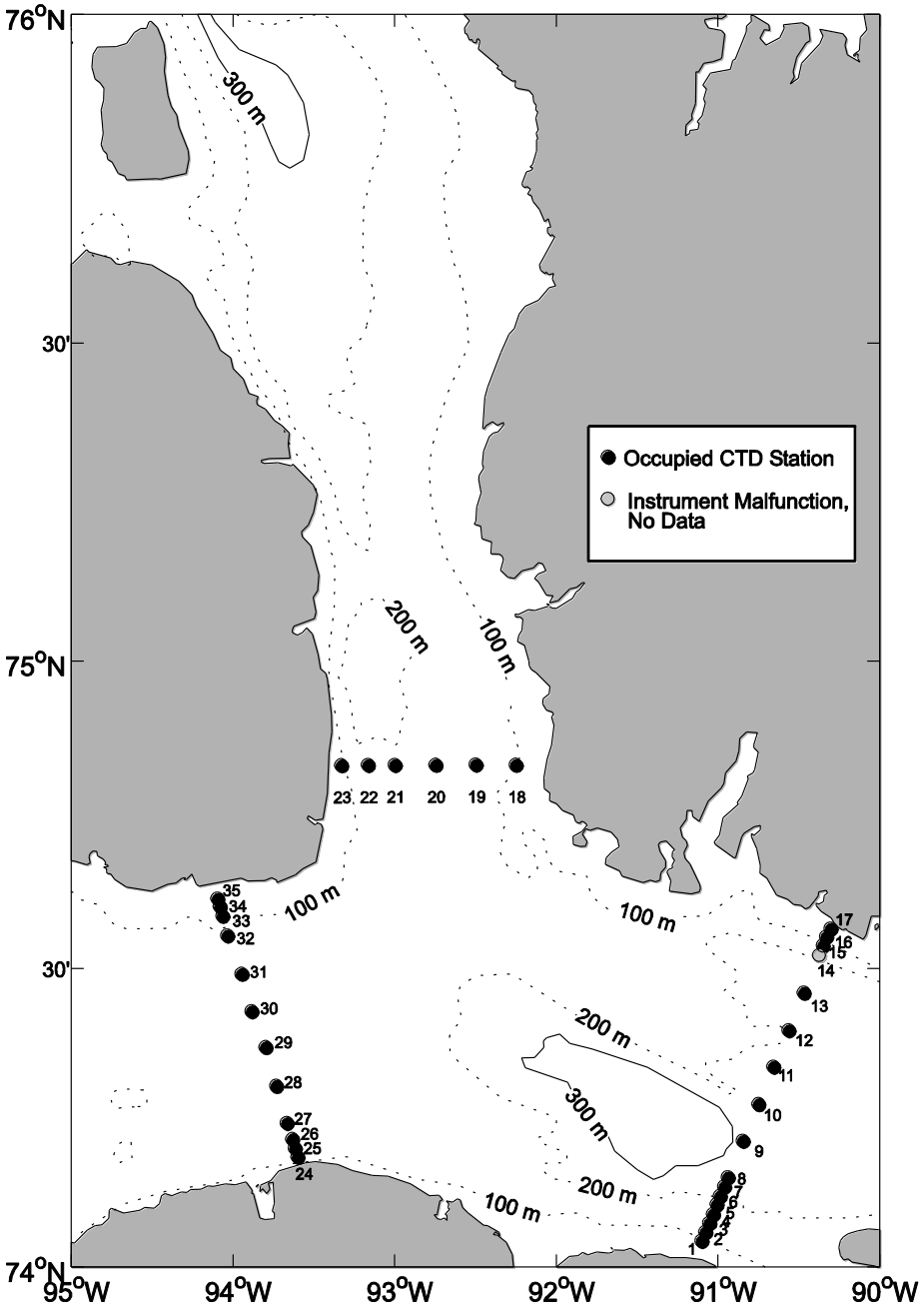


Figure 53: Eastern Barrow Strait CTD Line, Aug. 3-4, 2007.

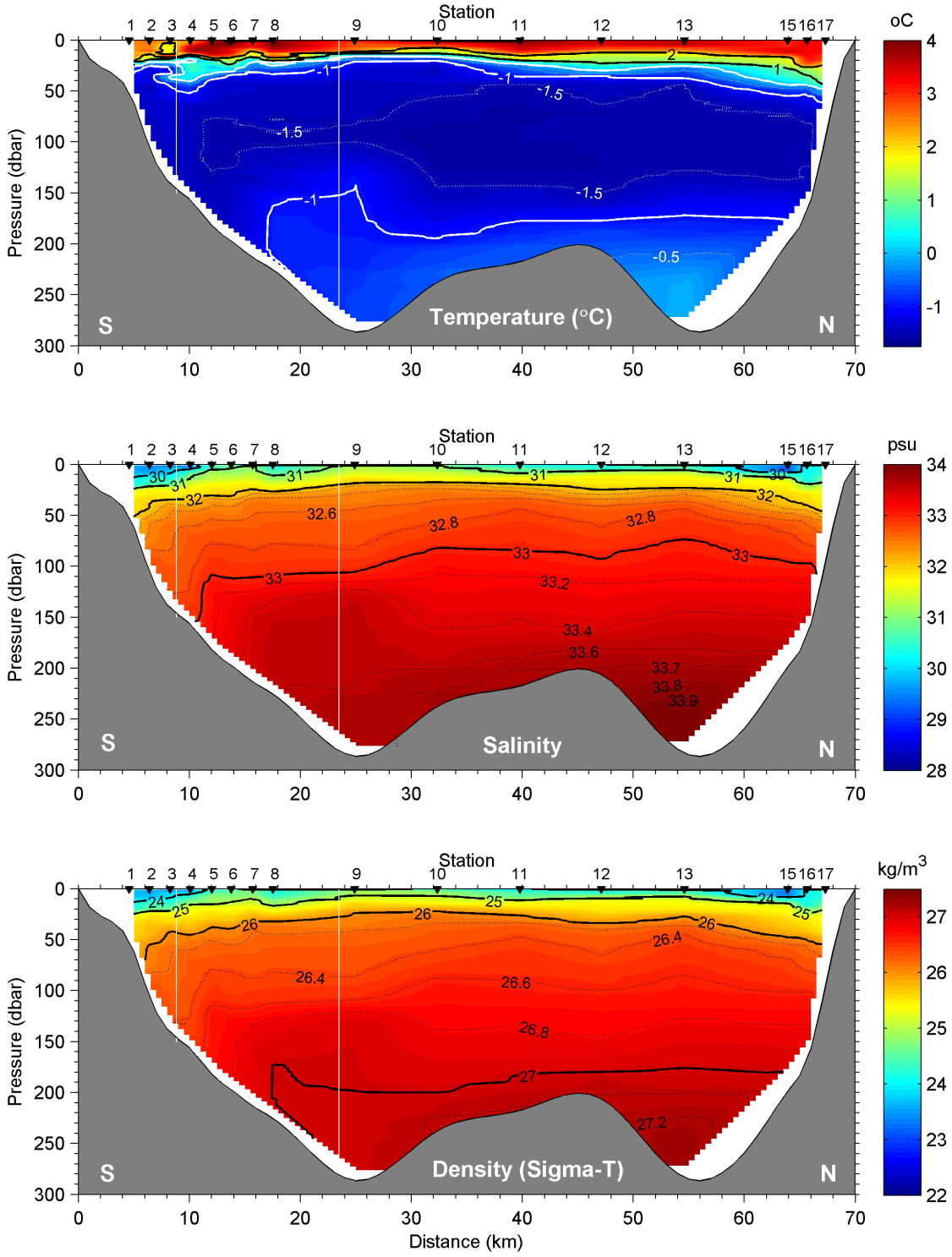


Figure 54: Wellington Channel CTD Line, Aug. 5, 2007.

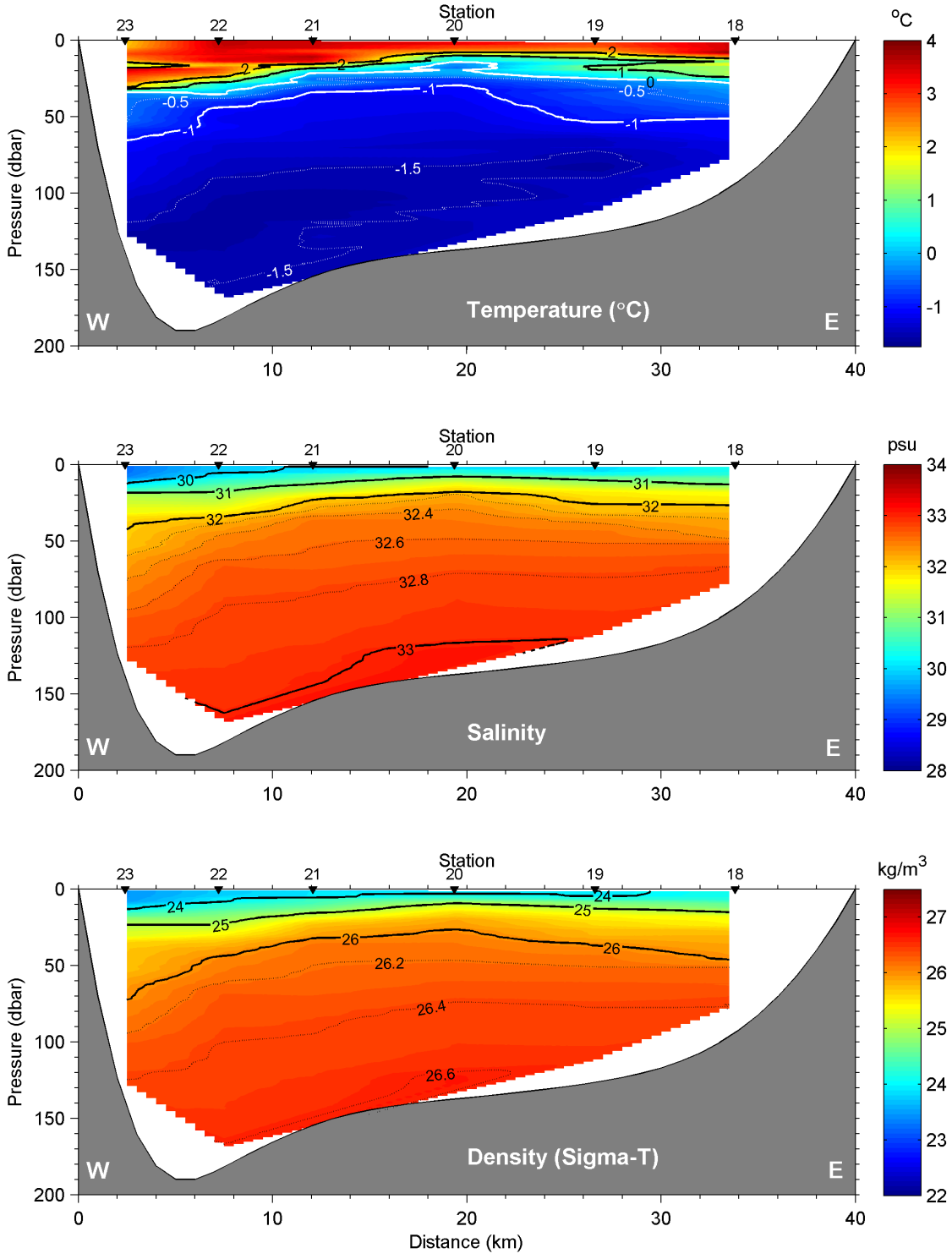


Figure 55: Western Barrow Strait CTD Line, Aug. 6, 2007.

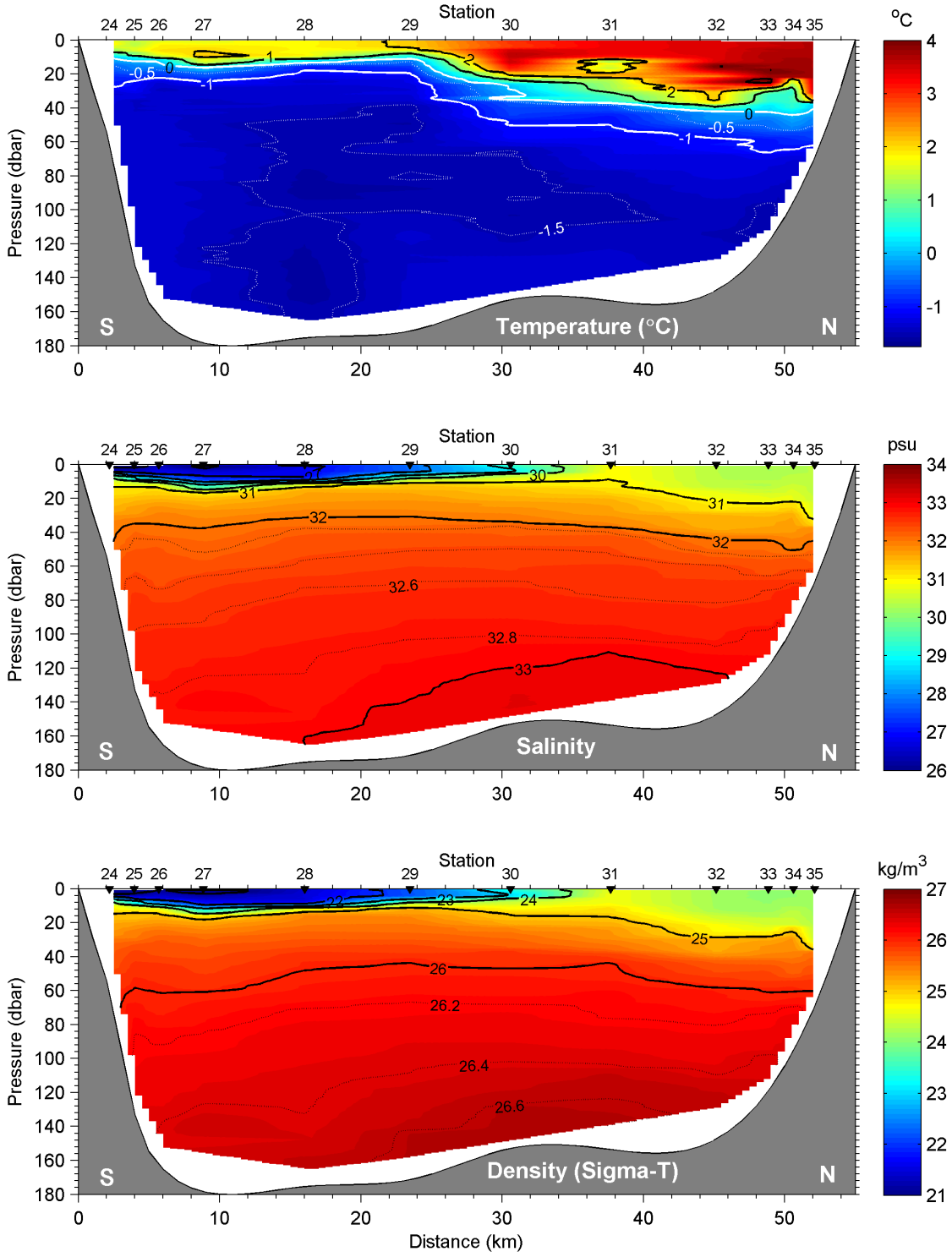


Table 1: Mooring Summary, 2006-2007

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)
1604	ICYCLER	50	153	74.0843	-91.0142	Instrument Lost		86400
1604	MCTD	62†	153	74.0843	-91.0142	05-Aug-2006 14:00	31-Jul-2007 15:00	1800
1605	MCTD	47	147	74.0839	-91.0537	05-Aug-2006 18:30	29-Jul-2007 18:30	1800
1605	ADCP	85	147	74.0839	-91.0537	05-Aug-2006 20:00	29-Jul-2007 18:00	7200
1605	MCTD	87	147	74.0839	-91.0537	05-Aug-2006 18:30	29-Jul-2007 18:30	1800
1605	MCTD	144	147	74.0839	-91.0537	05-Aug-2006 18:30	29-Jul-2007 18:30	1800

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)
1606	LRADCP*	253	266	74.1958	-90.8490	05-Aug-2006 00:00	29-Jul-2007 16:00	7200
1606	MCTD	263	266	74.1958	-90.8490	04-Aug-2006 23:00	29-Jul-2007 17:30	1800
1607	MCTD	35	265	74.1990	-90.8458	04-Aug-2006 23:00	29-Jul-2007 14:30	1800
1607	ADCP	73‡	265	74.1990	-90.8458	05-Aug-2006 00:00	28-Jul-2007 22:00	7200
1607	MCTD	155	265	74.1990	-90.8458	04-Aug-2006 23:00	29-Jul-2007 14:30	1800
1608	IPS	53	268	74.1943	-90.8644	04-Aug-2006 21:57	29-Jul-2007 17:10	2
1608	MCTD	78	268	74.1943	-90.8644	04-Aug-2006 22:30	29-Jul-2007 17:00	1800

† After the Icycler departed 6-Dec-2006, the instrument sank to the bottom (153 m).

‡ The battery was found to be dead on recovery, but logged data to within 16 hours of its planned recovery time.

*A buoyancy element leaked changing the attitude of the instrument during the year; introducing rate and direction errors after Dec 8 (see Fig. 8)

Table 2: South Barrow Strait, Microcat/ADCP statistical summary
Late summer: August 5, 2006 - September 20, 2006

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
47	47	-1.31	0.09	-1.48	-0.68	32.18	0.18	31.59	32.60	25.88	0.15	25.40	26.20	21.37	15.01	-24.64	60.75	5.51	6.17	-15.21	32.52
62	63	-1.32	0.09	-1.51	-0.28	32.39	0.13	31.94	32.70	26.05	0.10	25.68	26.30	20.65	15.10	-21.80	72.45	5.16	5.37	-13.81	26.97
87	79	-1.31	0.07	-1.53	-0.56	32.62	0.08	32.27	32.81	26.23	0.06	25.95	26.39	19.43	14.88	-30.15	63.16	4.32	5.06	-13.24	28.63
144		-1.27	0.06	-1.42	-0.96	32.83	0.14	32.51	33.50	26.40	0.11	26.15	26.93								

Table 3: South-Central Barrow Strait, Microcat/ADCP statistical summary
Late summer: August 5, 2006 - September 20, 2006

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
35	35	-1.05	0.42	-1.50	1.17	32.29	0.21	31.20	32.81	25.96	0.17	25.05	26.38	17.04	15.15	-27.56	55.97	3.48	7.50	-18.85	35.01
78	76	-1.32	0.16	-1.58	-0.25	32.73	0.07	32.47	33.01	26.33	0.06	26.08	26.55	12.87	14.07	-25.64	48.83	7.36	7.62	-15.30	30.47
155	156	-1.19	0.06	-1.38	-0.87	33.18	0.13	32.89	33.71	26.68	0.11	26.46	27.11	10.09	14.98	-28.88	40.27	7.53	6.88	-10.08	28.90
263	236	-0.49	0.13	-1.04	-0.26	33.81	0.07	33.35	33.98	27.17	0.05	26.82	27.30	2.02	17.56	-36.82	38.27	11.99	9.03	-11.47	43.21

Table 4: South Barrow Strait, Microcat/ADCP statistical summary
Fall: September 21, 2006 - December 20, 2006

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
47	47	-1.42	0.28	-1.75	0.07	31.97	0.43	30.58	33.03	25.71	0.34	24.58	26.56	13.85	21.48	-62.88	84.38	3.94	8.93	-18.01	76.08
62 †	63	-1.28	0.22	-1.74	-0.06	32.17	0.43	30.62	33.13	25.87	0.35	24.62	26.64	12.05	19.91	-61.23	72.06	3.84	7.81	-17.73	54.39
87	79	-1.24	0.16	-1.69	-0.33	32.53	0.30	30.96	33.26	26.16	0.24	24.89	26.74	9.38	19.31	-61.91	69.97	3.55	7.34	-17.87	65.44
144		-1.09	0.16	-1.30	-0.63	33.16	0.30	32.26	33.73	26.66	0.24	25.94	27.11								

† Data ended Dec. 6, 2006 at 11:00 GMT

Table 5: South-Central Barrow Strait, Microcat/ADCP statistical summary
Fall: September 21, 2006 - December 20, 2006

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
35	35	-1.35	0.38	-1.75	0.48	31.80	0.41	30.57	32.77	25.57	0.33	24.58	26.34	5.61	15.67	-39.71	67.84	1.64	7.77	-28.68	23.71
78	76	-1.25	0.15	-1.74	-0.78	32.61	0.19	31.90	33.14	26.22	0.15	25.65	26.65	4.23	14.93	-35.66	47.29	4.34	8.35	-37.16	34.77
155	156	-1.11	0.08	-1.24	-0.69	33.27	0.16	32.83	33.71	26.76	0.13	26.40	27.10	3.91	15.69	-29.50	47.12	5.46	6.85	-17.88	30.88
263	236	-0.47	0.13	-1.01	-0.02	33.81	0.06	33.37	34.07	27.17	0.05	26.83	27.36	0.95	15.64	-42.40	41.66	9.87	7.50	-8.76	36.50

Table 6: South Barrow Strait, Microcat/ADCP statistical summary
Winter: December 21, 2006 - March 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
47	47	-1.73	0.05	-1.79	-1.50	32.33	0.18	31.85	32.79	26.01	0.15	25.62	26.38	3.72	14.94	-45.40	45.73	0.66	5.94	-17.03	23.31
62	63													1.29	15.42	-48.52	46.65	0.95	5.98	-18.63	24.94
87	79	-1.64	0.13	-1.79	-1.14	32.63	0.13	32.17	33.10	26.25	0.11	25.88	26.62	-0.68	15.76	-49.93	49.72	1.22	6.09	-19.42	24.70
144		-1.04	0.25	-1.61	-0.42	33.25	0.26	32.60	33.79	26.74	0.20	26.22	27.15								

Table 7: South-Central Barrow Strait, Microcat/ADCP statistical summary
Winter: December 21, 2006 - March 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
35	35	-1.73	0.05	-1.80	-1.37	32.27	0.23	31.58	32.65	25.96	0.19	25.40	26.27	6.97	13.55	-34.15	49.01	-0.17	6.01	-25.78	19.47
78	76†	-1.65	0.15	-1.79	-1.14	32.71	0.14	32.16	33.01	26.31	0.12	25.87	26.56	3.42	14.61	-38.58	47.69	3.51	8.11	-16.70	39.50
155	156†	-1.14	0.17	-1.72	-0.64	33.22	0.13	32.84	33.71	26.72	0.10	26.41	27.09	2.09	15.55	-36.48	44.54	5.17	7.19	-15.36	30.44
263	236†	-0.36	0.09	-0.78	-0.06	33.83	0.05	33.57	33.99	27.18	0.03	26.99	27.30	-1.30	14.99	-40.60	40.65	9.32	6.92	-11.34	32.58

† Shading denotes questionable accuracy due to instrument tilt which the instrument did not compensate for

Table 8: South Barrow Strait, Microcat/ADCP statistical summary
Spring: March 21, 2007 - June 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
47	47	-1.62	0.08	-1.77	-1.39	32.31	0.18	31.78	32.72	25.99	0.14	25.56	26.32	7.70	14.60	-36.06	49.78	0.91	6.21	-22.96	23.17
62	63													6.25	14.89	-45.73	51.15	1.26	5.89	-21.93	20.63
87	79	-1.63	0.06	-1.77	-1.42	32.70	0.10	32.28	32.96	26.30	0.08	25.97	26.52	4.06	15.27	-47.27	48.86	1.20	5.92	-19.08	19.48
144		-1.35	0.25	-1.68	-0.59	33.16	0.27	32.69	33.69	26.67	0.21	26.30	27.07								

Table 9: South-Central Barrow Strait, Microcat/ADCP statistical summary
Spring: March 21, 2007 - June 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
35	35	-1.67	0.07	-1.79	-1.21	32.49	0.25	31.70	32.93	26.14	0.20	25.50	26.50	12.87	15.95	-27.06	59.80	0.39	8.68	-30.92	26.92
78	76†	-1.67	0.06	-1.79	-1.35	32.80	0.12	32.19	33.18	26.39	0.09	25.90	26.69	2.92	10.97	-30.49	35.58	3.61	6.83	-25.98	28.57
155	156†	-1.49	0.20	-1.80	-0.87	33.21	0.16	32.73	33.63	26.72	0.13	26.33	27.04	0.45	9.50	-33.52	29.55	3.37	6.06	-12.96	39.02
263	236†	-0.54	0.14	-1.20	-0.27	33.73	0.07	33.38	33.86	27.11	0.05	26.84	27.20	-1.73	12.47	-35.39	32.44	8.83	7.31	-13.29	33.83

† Shading denotes questionable accuracy due to instrument tilt which the instrument did not compensate for

Table 10: South Barrow Strait, Microcat/ADCP statistical summary
Early Summer: June 21, 2007 – July 29, 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
47	47	-1.45	0.15	-1.70	-0.50	32.53	0.21	31.89	32.90	26.16	0.17	25.64	26.47	18.92	14.97	-21.73	56.23	4.44	5.81	-9.22	27.45
62	63													14.76	14.53	-22.41	54.46	3.46	5.17	-13.91	19.77
87	79	-1.55	0.10	-1.75	-1.18	32.82	0.13	32.37	33.19	26.40	0.11	26.04	26.70	11.48	14.65	-29.53	42.16	2.62	5.16	-13.74	18.28
144		-1.44	0.16	-1.68	-0.78	33.16	0.20	32.81	33.64	26.67	0.16	26.40	27.04								

Table 11: South-Central Barrow Strait, Microcat/ADCP statistical summary
Early Summer: June 21, 2007 - July 29, 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
35	35	-1.45	0.17	-1.75	-0.33	32.71	0.15	32.10	32.94	26.31	0.13	25.82	26.50	7.82	16.52	-32.79	46.15	5.03	8.62	-24.50	32.76
78	76†	-1.57	0.05	-1.76	-1.33	32.97	0.11	32.60	33.19	26.53	0.09	26.22	26.71	2.43	13.66	-36.81	38.35	8.13	7.10	-9.84	32.57
155	156†	-1.35	0.18	-1.65	-0.77	33.40	0.09	33.15	33.67	26.87	0.07	26.67	27.07	1.56	13.67	-36.24	38.62	6.41	6.63	-10.82	26.23
263	236†	-0.62	0.08	-1.04	-0.26	33.70	0.04	33.53	33.89	27.08	0.03	26.96	27.23	-1.76	14.42	-40.85	34.36	8.92	7.08	-7.65	33.71

† Shading denotes questionable accuracy due to tilt which the instrument did not compensate for

Table 12: South Barrow Strait, Microcat/ADCP statistical summary
Complete Record: August 5, 2006 – July 29, 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
47	47	-1.54	0.22	-1.79	0.07	32.23	0.32	30.58	33.03	25.93	0.26	24.58	26.56	11.24	17.89	-62.88	84.38	2.59	7.15	-22.96	76.08
62	63													9.25	17.60	-61.23	72.45	2.58	6.52	-21.93	54.39
87	79	-1.48	0.21	-1.79	-0.33	32.64	0.20	30.96	33.26	26.26	0.16	24.89	26.74	7.01	17.59	-61.91	69.97	2.36	6.30	-19.42	65.44
144		-1.20	0.25	-1.68	-0.42	33.14	0.28	32.26	33.79	26.65	0.22	25.94	27.15								

Table 13: South-Central Barrow Strait, Microcat/ADCP statistical summary
Complete Record: August 5, 2006 - July 29, 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
35	35	-1.50	0.34	-1.80	1.17	32.26	0.41	30.57	32.94	25.94	0.33	24.58	26.50	9.55	15.78	-39.71	67.84	1.47	7.86	-30.92	35.01
78	76†	-1.50	0.22	-1.79	-0.25	32.74	0.18	31.90	33.19	26.33	0.14	25.65	26.71	4.65	14.08	-38.58	48.83	4.76	7.89	-37.16	39.50
155	156†	-1.25	0.22	-1.80	-0.64	33.25	0.16	32.73	33.71	26.74	0.12	26.33	27.11	3.13	14.31	-36.48	47.12	5.23	6.85	-17.88	39.02
263	236†	-0.48	0.14	-1.20	-0.02	33.78	0.07	33.35	34.07	27.15	0.05	26.82	27.36	-0.45	14.93	-42.40	41.66	9.64	7.55	-13.29	43.21

† Shading denotes questionable accuracy due to instrument tilt which the instrument did not compensate for

Table 14- Tidal Constants for K1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 5, 2006 – Nov. 2, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	8.95	-0.85	168	359
15	8.89	-0.67	168	358
19	8.42	-0.40	167	357
23	8.26	-0.01	166	354
27	8.10	0.35	166	354
31	8.00	0.55	165	354
35	7.95	0.69	166	352
39	7.72	0.75	165	350
43	7.52	0.87	165	348
47	7.38	1.16	164	348
51	7.28	1.28	165	348
55	7.14	1.32	166	347
59	6.96	1.53	165	345
63	6.78	1.62	164	341
67	6.69	1.79	163	338
71	6.74	1.88	161	336
75	6.87	1.88	160	335
79	7.00	1.93	159	333

For Solid Ice Period (Mar. 3, 2007 – Jun. 12, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	7.15	1.83	171	327
15	7.73	1.88	170	329
19	8.30	1.77	168	330
23	8.63	1.68	166	329
27	8.78	1.70	163	327
31	8.84	1.71	161	327
35	8.66	1.53	158	326
39	8.29	1.75	156	324
43	8.03	2.00	155	322
47	8.12	2.25	154	321
51	8.37	2.22	153	321
55	8.52	1.92	152	320
59	8.45	1.94	150	318
63	8.60	1.93	148	316
67	8.82	2.11	147	315
71	8.97	2.27	146	314
75	9.18	2.39	146	314
79	9.25	2.45	145	313

Table 14 - Tidal Constants for K1 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	11.80	-1.52	165	359
15	11.57	-1.42	164	358
19	11.61	-1.45	165	356
23	11.52	-1.26	164	354
27	11.31	-1.15	163	353
31	11.45	-1.12	162	354
35	11.68	-0.74	161	356
39	Data contaminated by top float of mooring			
43	12.43	-0.55	162	359
47	12.59	-0.72	163	359
51	12.57	-0.79	162	359
55	12.76	-0.78	161	358
59	12.96	-0.63	160	358
63	13.08	-0.60	160	357
67	12.89	-0.61	160	357

For Solid Ice Period

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11				
15				
19				
23				
27				
31				
35				
39	**Insufficient Period for Analysis**			
43				
47				
51				
55				
59				
63				
67				

Table 14 - Tidal Constants for K1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
28	10.64	0.43	190	354
36	10.62	0.43	187	355
44	11.05	0.27	184	356
52	11.43	0.11	182	356
60	11.63	0.19	180	356
68	11.85	0.20	179	355
76	11.88	0.45	177	355
84	11.90	0.20	175	355
92	11.87	0.09	174	356
100	11.97	0.04	174	357
108	12.12	-0.08	174	358
116	12.52	-0.22	173	358
124	12.74	-0.45	172	0
132	12.91	-0.75	172	1
140	13.33	-0.76	172	1
148	13.87	-0.92	172	1
156	14.02	-0.92	171	1
164	14.41	-0.83	171	1
172	14.80	-0.76	170	0
180	15.04	-0.65	170	359
188	15.39	-1.12	169	0
196	15.75	-1.22	169	0
204	16.06	-1.45	167	0
212	16.55	-1.58	165	359
220	16.96	-1.66	162	0
228	16.75	-1.65	161	2
236	17.07	-2.20	159	4

For Solid Ice Period:

Insufficient Period For Analysis

Table 15 - Tidal Constants for M2 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 5, 2006 – Nov. 2, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	7.63	0.28	168	198
15	7.91	-0.03	166	197
19	8.16	-0.51	165	199
23	8.31	-0.80	166	200
27	8.35	-0.85	168	200
31	8.32	-0.78	169	202
35	8.11	-0.93	169	203
39	8.03	-0.86	168	204
43	8.12	-0.98	168	205
47	8.26	-1.02	168	205
51	8.42	-0.81	169	205
55	8.52	-0.69	168	205
59	8.55	-0.72	168	204
63	8.63	-0.87	167	204
67	8.54	-0.96	167	205
71	8.69	-1.02	166	206
75	8.78	-0.94	165	207
79	8.67	-0.90	165	209

For Solid Ice Period (Mar. 3, 2007 – Jun. 12, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	4.37	1.40	171	202
15	5.34	1.35	169	197
19	5.81	0.97	167	196
23	6.37	0.61	167	198
27	6.97	0.26	167	200
31	7.63	-0.22	167	200
35	8.51	-0.82	167	202
39	9.31	-1.51	166	201
43	9.84	-2.08	165	199
47	9.96	-2.37	163	196
51	9.89	-2.15	161	194
55	9.92	-2.12	158	191
59	9.60	-1.85	157	190
63	9.27	-1.53	157	190
67	9.06	-1.47	157	191
71	9.00	-1.46	157	193
75	9.04	-1.62	156	194
79	8.88	-1.55	157	195

Table 15 - Tidal Constants for M2 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	7.40	0.28	162	193
15	7.74	-0.18	164	196
19	7.99	-0.57	166	199
23	8.45	-0.95	168	198
27	8.67	-0.94	168	200
31	8.73	-1.12	167	201
35	8.60	-1.22	167	199
39	Data contaminated by top float of mooring			
43	9.28	-1.42	167	199
47	9.26	-1.45	168	200
51	9.09	-1.34	167	200
55	9.02	-1.35	167	200
59	9.00	-1.47	167	200
63	9.14	-1.46	167	200
67	9.19	-1.45	167	199

For Solid Ice Period

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11				
15				
19				
23				
27				
31				
35				
39	**Insufficient Period for Analysis**			
43				
47				
51				
55				
59				
63				
67				

Table 15 - Tidal Constants for M2 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
28	8.11	-1.97	184	197
36	8.63	-2.15	184	197
44	9.09	-2.49	185	197
52	9.22	-2.55	184	198
60	9.20	-2.56	184	198
68	9.17	-2.58	184	198
76	9.17	-2.51	184	198
84	8.99	-2.34	184	198
92	9.05	-2.22	182	199
100	9.21	-2.16	182	198
108	9.05	-2.31	182	199
116	8.84	-2.04	183	199
124	8.69	-1.83	182	199
132	8.49	-1.67	182	198
140	8.47	-1.62	182	199
148	8.64	-1.64	182	201
156	8.31	-1.60	183	201
164	8.15	-1.46	184	202
172	8.12	-1.10	183	202
180	8.45	-1.25	186	203
188	8.52	-1.53	187	203
196	8.52	-1.86	188	204
204	8.68	-2.39	189	206
212	8.65	-2.50	190	208
220	8.36	-2.47	191	210
228	7.74	-2.08	192	212
236	6.94	-1.29	199	213

For Solid Ice Period:

Insufficient Period For Analysis

Table 16 - Tidal Constants for O1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 5, 2006 – Nov. 2, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	4.52	0.88	163	309
15	4.45	0.66	167	311
19	4.23	0.52	166	311
23	4.03	0.54	165	307
27	4.05	0.44	161	303
31	4.08	0.41	161	303
35	3.91	0.44	163	304
39	3.96	0.45	163	303
43	3.87	0.39	163	300
47	3.75	0.32	160	296
51	3.74	0.32	158	293
55	3.75	0.41	159	291
59	3.69	0.47	161	288
63	3.73	0.56	162	288
67	3.78	0.53	162	289
71	3.87	0.51	162	288
75	3.93	0.45	158	286
79	3.80	0.53	158	284

For Solid Ice Period (Mar. 3, 2007 – Jun. 12, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	3.25	0.64	168	269
15	3.30	0.82	162	272
19	3.37	0.90	160	275
23	3.48	0.87	157	275
27	3.58	0.77	157	274
31	3.62	0.62	157	274
35	3.62	0.52	157	272
39	3.54	0.58	156	268
43	3.57	0.74	154	265
47	3.42	0.72	152	262
51	3.57	0.72	153	261
55	3.69	0.50	153	261
59	3.76	0.46	150	258
63	3.74	0.50	148	256
67	3.76	0.60	148	254
71	3.71	0.63	148	254
75	3.64	0.68	148	254
79	3.71	0.66	146	253

Table 16 - Tidal Constants for O1 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	5.50	0.75	164	301
15	5.53	0.73	164	301
19	5.77	0.57	163	300
23	5.90	0.40	160	299
27	5.82	0.40	160	299
31	5.75	0.48	160	300
35	5.73	0.49	159	300
39	Data contaminated by top float of mooring			
43	6.08	0.53	159	302
47	6.15	0.57	158	303
51	6.18	0.47	157	304
55	6.19	0.40	157	305
59	6.28	0.49	156	306
63	6.34	0.42	156	307
67	6.34	0.29	157	308

For Solid Ice Period

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11				
15				
19				
23				
27				
31				
35				
39	**Insufficient Period for Analysis**			
43				
47				
51				
55				
59				
63				
67				

Table 16 - Tidal Constants for O1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
28	5.12	0.80	182	301
36	5.06	0.77	180	301
44	4.92	0.95	179	302
52	5.10	0.88	178	303
60	5.27	0.90	177	307
68	5.43	0.97	176	309
76	5.52	0.91	173	308
84	5.60	0.73	172	307
92	5.62	0.78	170	307
100	5.75	0.89	170	307
108	5.83	0.92	170	308
116	5.86	0.95	170	309
124	6.00	0.95	170	309
132	6.18	0.84	169	309
140	6.45	0.80	171	309
148	6.75	0.76	171	308
156	6.96	0.66	171	306
164	6.99	0.52	170	306
172	7.05	0.57	170	306
180	6.99	0.74	169	306
188	6.77	0.82	170	306
196	7.05	0.75	170	304
204	7.19	0.79	166	301
212	7.27	0.63	163	299
220	7.56	0.43	159	296
228	7.64	0.13	158	296
236	7.58	-0.11	159	298

For Solid Ice Period:

Insufficient Period For Analysis

Table 17 - Tidal Constants for P1 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 5, 2006 – Nov. 2, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	3.76	-1.70	182	326
15	3.72	-1.74	177	330
19	3.25	-1.71	172	331
23	3.03	-1.68	170	329
27	2.77	-1.42	165	338
31	2.64	-1.11	165	340
35	2.33	-0.84	170	338
39	2.01	-0.95	169	340
43	2.06	-0.94	171	337
47	1.82	-0.79	166	336
51	1.50	-0.89	165	337
55	1.35	-0.71	181	323
59	1.47	-0.38	179	313
63	1.62	-0.23	178	301
67	1.73	-0.34	176	293
71	1.75	-0.51	174	289
75	1.87	-0.59	171	285
79	2.09	-0.69	164	292

For Solid Ice Period (Mar. 3, 2007 – Jun. 12, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	2.30	0.64	150	309
15	2.97	0.74	152	331
19	3.06	0.45	151	335
23	3.19	0.13	152	333
27	3.16	0.19	151	329
31	3.34	0.31	153	330
35	3.38	0.28	152	332
39	3.13	0.40	155	331
43	3.25	0.49	159	331
47	3.09	0.46	162	333
51	3.17	0.61	162	331
55	3.08	0.58	154	328
59	2.95	0.77	153	328
63	2.98	0.98	153	325
67	2.96	1.08	154	323
71	3.21	1.11	153	321
75	3.39	1.16	154	324
79	3.42	1.21	155	325

Table 17 - Tidal Constants for P1 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	3.76	-1.03	159	359
15	3.52	-1.08	163	357
19	3.74	-1.14	172	349
23	3.66	-0.70	168	346
27	3.67	-0.47	166	339
31	3.58	-0.29	161	340
35	3.42	0.12	154	344
39	Data contaminated by top float of mooring			
43	2.85	0.46	161	347
47	3.07	0.32	167	351
51	3.35	0.28	165	351
55	3.44	0.57	164	351
59	3.41	0.76	164	351
63	3.41	0.81	161	347
67	3.37	0.79	159	347

For Solid Ice Period

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11				
15				
19				
23				
27				
31				
35				
39	**Insufficient Period for Analysis**			
43				
47				
51				
55				
59				
63				
67				

Table 17 - Tidal Constants for P1 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
28	3.22	-0.65	198	354
36	2.67	-0.26	198	351
44	2.93	-0.05	191	353
52	3.28	-0.15	196	356
60	3.21	0.03	190	356
68	3.19	0.20	187	353
76	3.23	0.32	183	355
84	3.26	0.20	177	353
92	3.26	0.04	178	350
100	3.16	0.13	180	353
108	2.96	0.26	178	359
116	3.36	0.31	178	353
124	3.22	0.11	176	355
132	3.17	0.14	180	355
140	3.41	0.39	181	356
148	3.63	0.27	179	352
156	3.63	0.49	175	348
164	3.60	0.52	176	346
172	3.79	0.65	173	346
180	4.21	1.03	172	341
188	4.24	0.78	173	345
196	4.33	1.07	171	343
204	4.53	1.11	166	336
212	4.83	0.91	159	332
220	5.09	0.90	155	330
228	5.02	1.24	152	331
236	5.01	0.91	150	331

For Solid Ice Period:

Insufficient Period For Analysis

Table 18 - Tidal Constants for S2 Constituent

South Side Barrow Strait

For Ice Free Period (Aug. 5, 2006 – Nov. 2, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	4.48	-1.12	166	234
15	4.51	-1.03	169	234
19	4.24	-0.78	173	234
23	4.14	-0.64	177	236
27	4.33	-0.57	176	240
31	4.56	-0.56	175	241
35	4.64	-0.46	175	240
39	4.59	-0.49	175	239
43	4.66	-0.46	174	242
47	4.65	-0.41	174	245
51	4.53	-0.43	174	246
55	4.38	-0.31	174	245
59	4.22	-0.18	173	243
63	4.12	-0.23	171	242
67	4.14	-0.24	171	242
71	4.04	-0.22	171	244
75	4.08	-0.36	168	245
79	4.04	-0.36	165	246

For Solid Ice Period (Mar. 3, 2007 – Jun. 12, 2007):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	0.76	0.39	153	230
15	1.33	0.46	154	229
19	1.68	0.47	157	225
23	2.02	0.39	161	223
27	2.26	0.23	162	227
31	2.78	-0.03	166	230
35	3.24	-0.55	169	232
39	3.69	-1.28	171	231
43	4.10	-1.66	172	229
47	4.32	-1.83	174	227
51	4.39	-2.03	174	227
55	4.31	-1.99	173	230
59	3.99	-1.89	175	230
63	3.72	-1.62	175	231
67	3.51	-1.41	175	233
71	3.30	-1.22	173	236
75	3.15	-1.15	170	238
79	2.98	-1.07	168	237

Table 18 - Tidal Constants for S2 Constituent (continued)

South-Central Barrow Strait (Workhorse ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11	4.85	-1.40	152	227
15	4.79	-1.43	158	230
19	4.74	-1.05	162	235
23	4.68	-0.93	164	239
27	4.65	-0.90	167	242
31	4.70	-0.97	169	247
35	4.69	-1.09	171	249
39	Data contaminated by top float of mooring			
43	5.02	-1.34	174	250
47	4.96	-1.39	174	251
51	4.89	-1.53	175	251
55	4.93	-1.55	176	252
59	5.10	-1.44	177	254
63	5.02	-1.46	176	253
67	4.87	-1.50	176	252

For Solid Ice Period

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
11				
15				
19				
23				
27				
31				
35				
39	**Insufficient Period for Analysis**			
43				
47				
51				
55				
59				
63				
67				

Table 18 - Tidal Constants for S2 Constituent (continued)

South-Central Barrow Strait (Long Ranger ADCP)

For Ice Free Period (Aug. 5, 2006 – Nov. 4, 2006):

Depth (m)	Major Amplitude (cm/s)	Minor Amplitude (cm/s)	Orientation (degrees cc from East)	Greenwich Phase (degrees)
28	4.59	-0.80	180	240
36	4.81	-0.86	183	246
44	4.80	-0.95	183	249
52	4.79	-0.97	185	250
60	4.80	-1.08	186	252
68	4.88	-1.21	189	249
76	4.70	-1.28	188	249
84	4.72	-1.12	185	251
92	4.67	-1.24	185	251
100	4.58	-1.15	185	250
108	4.51	-1.18	185	249
116	4.48	-1.13	185	249
124	4.38	-1.21	182	249
132	4.37	-1.26	181	250
140	4.41	-1.31	182	251
148	4.20	-1.14	183	252
156	3.85	-0.95	181	254
164	3.68	-0.77	183	256
172	3.47	-0.61	187	258
180	3.11	-0.29	188	259
188	2.79	-0.07	186	257
196	2.54	-0.08	185	256
204	2.21	0.00	184	251
212	1.99	-0.03	176	244
220	1.77	-0.16	167	245
228	1.79	-0.37	162	242
236	1.85	-0.61	170	243

For Solid Ice Period:

Insufficient Period For Analysis

Table 19: Ice Profiling Sonar, Ice Draft Monthly Statistics
South-Central Barrow Strait, August 2006 – July 2007

		Ice Draft (m)		
Year	**Month**	**Mean**	**Maximum**	**Std.Dev**
2006	August	0.08	6.40	0.21
	September	0.00	0.00	0.00
	October	0.00	0.91	0.01
	November	0.68	11.45	0.77
	December	1.69	17.48	1.61
2007	January	1.38	14.69	1.35
	February	1.19	17.85	1.22
	March	0.89	11.64	0.60
	April	0.42	14.95	0.43
	May	0.14	5.69	0.19
	June	0.18	8.48	0.40
	July	0.02	4.87	0.12

Table 20: Ice Profiling Sonar, Ice Draft Percent Frequency by Month
South-Central Barrow Strait, August 2006 – July 2007

	2006					2007						
Ice Draft (m)	**August**	**September**	**October**	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**July**
Open Water	74.42	100.00	99.66	1.45	0.00	0.00	0.00	0.00	0.04	23.79	79.52	96.13
0.0-0.5	24.32	0.00	0.32	59.19	11.47	15.89	13.89	6.29	69.91	74.55	0.62	3.11
0.5-1.0	0.59	0.00	0.02	24.27	40.03	42.10	55.71	82.15	23.51	0.94	14.59	0.44
1.0-1.5	0.28	0.00	0.00	6.22	13.73	11.32	13.64	5.85	5.81	0.34	4.45	0.18
1.5-2.0	0.11	0.00	0.00	3.05	7.35	6.85	3.43	1.68	0.29	0.18	0.51	0.08
2.0-2.5	0.12	0.00	0.00	2.05	5.67	7.63	3.34	1.40	0.17	0.10	0.14	0.03
2.5-3.0	0.06	0.00	0.00	1.26	4.28	5.82	2.74	0.76	0.07	0.05	0.07	0.02
3.0-3.5	0.05	0.00	0.00	0.84	3.70	2.77	1.66	0.53	0.04	0.02	0.04	0.00
3.5-4.0	0.03	0.00	0.00	0.62	3.73	3.01	1.39	0.39	0.03	0.01	0.03	0.00
4.0-4.5	0.02	0.00	0.00	0.35	2.55	1.29	1.21	0.30	0.03	0.01	0.02	0.00
4.5-5.0	0.01	0.00	0.00	0.23	2.82	0.84	0.68	0.18	0.02	0.00	0.01	0.00
5.0-5.5	0.00	0.00	0.00	0.15	1.21	0.65	0.63	0.19	0.01	0.00	0.00	0.00
5.5-6.0	0.00	0.00	0.00	0.10	0.93	0.47	0.41	0.11	0.01	0.00	0.00	0.00
6.0-6.5	0.00	0.00	0.00	0.07	0.72	0.35	0.29	0.06	0.01	0.00	0.00	0.00
6.5-7.0	0.00	0.00	0.00	0.05	0.49	0.24	0.20	0.04	0.01	0.00	0.00	0.00
7.0-7.5	0.00	0.00	0.00	0.03	0.38	0.18	0.17	0.03	0.01	0.00	0.00	0.00
7.5-8.0	0.00	0.00	0.00	0.02	0.24	0.13	0.13	0.01	0.01	0.00	0.00	0.00
8.0-8.5	0.00	0.00	0.00	0.02	0.20	0.10	0.10	0.01	0.00	0.00	0.00	0.00
8.5-9.0	0.00	0.00	0.00	0.01	0.13	0.08	0.09	0.00	0.00	0.00	0.00	0.00
9.0-9.5	0.00	0.00	0.00	0.01	0.10	0.06	0.08	0.00	0.00	0.00	0.00	0.00
9.5-10.0	0.00	0.00	0.00	0.00	0.06	0.06	0.04	0.00	0.00	0.00	0.00	0.00
>=10.0	0.00	0.00	0.00	0.01	0.19	0.15	0.16	0.00	0.01	0.00	0.00	0.00
Missing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 21: CTD Statistics

Station Number	Date/Time (GMT)	Latitude ^{o}N	Longitude ^{o}W	Pressure Maximum (dbar)	Station Sounding (m)	Minimum Temperature (Deg.C)	Maximum Temperature (Deg.C)	Minimum Salinity (psu)	Maximum Salinity (psu)	Minimum Sigma-T (kg/m^3)	Maximum Sigma-T (kg/m^3)
1	03-Aug-2007 13:03	74.0443	-91.1025	52.5	53.0	-1.2983	2.6302	29.7082	31.9404	23.7035	25.6822
2	03-Aug-2007 14:01	74.0595	-91.0795	99.5	100.0	-1.4841	2.8358	29.5578	32.7436	23.5723	26.3377
3	03-Aug-2007 14:44	74.0748	-91.0548	132.5	133.0	-1.4602	3.2374	29.4017	32.8205	23.4684	26.4007
4	03-Aug-2007 15:17	74.0901	-91.0318	153.0	153.0	-1.4691	3.9520	29.5424	32.8977	23.5611	26.4634
5	03-Aug-2007 18:30	74.1065	-91.0093	177.0	177.0	-1.5536	3.9247	30.4709	33.2234	24.2156	26.7274
6	03-Aug-2007 19:06	74.1210	-90.9897	188.5	191.0	-1.5686	4.2028	30.7294	33.3073	24.3715	26.7938
7	03-Aug-2007 19:51	74.1368	-90.9624	205.5	208.0	-1.5469	4.3502	29.3958	33.4515	23.2991	26.9053
8	03-Aug-2007 22:04	74.1522	-90.9413	213.0	220.0	-1.5362	3.9888	30.3423	33.5909	24.0869	27.0080
9	03-Aug-2007 22:45	74.2134	-90.8471	277.0	282.0	-1.5367	3.7692	29.5457	33.6649	23.4707	27.0613
10	04-Aug-2007 00:05	74.2751	-90.7515	228.5	235.0	-1.6160	4.1900	30.5470	33.7350	24.2279	27.1114
11	04-Aug-2007 00:55	74.3374	-90.6594	203.0	210.0	-1.6065	4.0085	30.2653	33.7053	24.0211	27.0904
12	04-Aug-2007 12:35	74.3981	-90.5645	193.0	200.0	-1.5795	3.4769	30.3506	33.6873	24.1386	27.0784
13	04-Aug-2007 13:25	74.4606	-90.4707	272.0	278.0	-1.5692	3.6042	30.7602	33.9558	24.4511	27.2676
15	04-Aug-2007 15:40	74.5382	-90.3526	177.0	191.0	-1.5554	3.4271	29.2035	33.5602	23.2587	26.9864
16	04-Aug-2007 17:10	74.5530	-90.3329	149.0	158.0	-1.5559	3.3058	29.2575	33.3597	23.2813	26.8373
17	04-Aug-2007 17:45	74.5659	-90.3048	67.5	76.0	-1.1715	3.2187	29.7149	32.6082	23.6520	26.2203
18	05-Aug-2007 12:30	74.8333	-92.2514	78.5	87.5	-1.2711	3.9005	30.3539	32.8272	24.1349	26.4009
19	05-Aug-2007 13:00	74.8336	-92.4999	111.5	120.0	-1.6027	2.8217	30.0011	32.9599	23.9109	26.5123
20	05-Aug-2007 13:40	74.8333	-92.7489	127.0	131.0	-1.5498	3.3459	30.0315	33.1289	23.8932	26.6519
21	05-Aug-2007 14:21	74.8330	-92.9994	142.5	147.0	-1.6300	3.6764	30.0515	32.9935	23.8967	26.5423
22	05-Aug-2007 15:21	74.8328	-93.1664	170.5	175.0	-1.6512	3.5768	29.8762	33.1217	23.7503	26.6458
23	05-Aug-2007 17:27	74.8326	-93.3316	129.0	134.0	-1.5970	3.6061	29.3564	32.8550	23.4399	26.4322
24	06-Aug-2007 12:25	74.1864	-93.6013	50.5	54.4	-1.3781	1.9471	25.8096	32.1528	20.6295	25.8561
25	06-Aug-2007 12:51	74.2014	-93.6182	122.0	125.0	-1.4276	1.6328	25.5393	32.7246	20.4283	26.3199
26	06-Aug-2007 13:15	74.2165	-93.6343	152.5	156.0	-1.4377	1.9626	26.3141	32.8657	21.0381	26.4341
27	06-Aug-2007 13:45	74.2434	-93.6673	142.0	173.0	-1.5104	2.1407	25.8703	32.9501	20.6788	26.5035
28	06-Aug-2007 14:27	74.3055	-93.7332	166.0	168.0	-1.6347	1.8548	26.8604	33.0082	21.4664	26.5551

Table 21: CTD Statistics (continued)

Station Name	Date/Time (GMT)	Latitude ^{o}N	Longitude ^{o}W	Pressure Maximum (dbar)	Station Sounding (m)	Minimum Temperature (Deg.C)	Maximum Temperature (Deg.C)	Minimum Salinity (psu)	Maximum Salinity (psu)	Minimum Sigma-T (kg/m^3)	Maximum Sigma-T (kg/m^3)
29	06-Aug-2007 15:27	74.3700	-93.7998	158.5	161.0	-1.5838	2.0692	27.7627	33.1082	22.1751	26.6317
30	06-Aug-2007 17:08	74.4300	-93.8859	142.5	146.0	-1.5742	3.6638	28.8918	33.1273	23.0189	26.6468
31	06-Aug-2007 17:40	74.4916	-93.9479	137.5	144.0	-1.5439	3.3327	30.9844	33.1176	24.6531	26.6390
32	06-Aug-2007 18:28	74.5548	-94.0352	129.0	133.0	-1.4914	4.0257	30.3656	33.0255	24.1539	26.5669
33	06-Aug-2007 19:10	74.5872	-94.0657	112.0	116.0	-1.5289	4.3522	30.2415	32.8606	24.0403	26.4349
34	06-Aug-2007 19:38	74.6024	-94.0829	78.5	83.3	-1.3812	3.9047	30.2851	32.6925	24.0761	26.2947
35	06-Aug-2007 20:06	74.6155	-94.0969	64.0	68.0	-1.0468	3.8419	30.4026	32.4126	24.1539	26.0580