BERING STRAIT NORSEMAN II 2014 MOORING CRUISE REPORT

Research Vessel Norseman II, Norseman Maritime Charters

Nome-Nome, 30th June – 7th July 2014

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and the Bering Strait 2014 Science Team

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(Photo from www.norsemanmartime.com)

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As part of Bering Strait projects funded by NSF-AON (Arctic Observing Network) and ONR, in June/July 2014 a team of US scientists undertook a ~ 7 day cruise in the Bering Strait and southern Chukchi Sea region on the US vessel Norseman II, operated by Norseman Maritime Charters.

The primary goals of the expedition were:

1) recovery of 3 moorings carrying physical oceanographic (Woodgate-ONR), bio-optical (Whitledge) and marine mammal acoustic (Stafford) instrumentation. These moorings were deployed in the Bering Strait region in 2013 from the Norseman II. The funding for the physical oceanographic components of these moorings comes from ONR.

2) deployment of 3 moorings in the Bering Strait region, carrying physical oceanographic (Woodgate), bio-optical (Whitledge) and marine mammal acoustic (Stafford) instrumentation. The funding for the physical oceanographic components of these moorings comes from NSF-AON.

3) accompanying CTD sections (without water sampling).

4) collection of accompanying ship's underway data (surface water properties, ADCP, meteorological data).

The cruise loaded and offloaded in Nome, Alaska.

SCIENCE BACKGROUND

The ~50m deep, ~ 85km wide Bering Strait is the only oceanic gateway between the Pacific and the Arctic oceans.

The oceanic fluxes of volume, heat, freshwater, nutrients and plankton through the Bering Strait are critical to the water properties of the Chukchi [*Woodgate et al.*, 2005a]; act as a trigger of sea-ice melt in the western Arctic [*Woodgate et al.*, 2010]; provide a subsurface source of heat to the Arctic in winter, possibly thinning sea-ice over about half of the Arctic Ocean [*Shimada et al.*, 2006; *Woodgate et al.*, 2010]; are ~ 1/3rd of the freshwater input to the Arctic [*Aagaard and Carmack*, 1989; *Woodgate and Aagaard*, 2005]; and are a major source of nutrients for ecosystems in the Arctic Ocean and the Canadian Archipelago [*Walsh et al.*, 1989]. In modeling studies, changes in the Bering Strait throughflow also influence the Atlantic Meridional Circulation [*Wadley and Bigg*, 2002] and thus world climate [*De Boer and Nof*, 2004].

Quantification of these fluxes (which all vary significantly seasonally and interannually) is critical to understanding the physics, chemistry and ecosystems of the Chukchi Sea and western Arctic, including sea-ice retreat timing and patterns, and possibly sea-ice thickness. Understanding the processes setting these fluxes is vital to prediction of future change in this region and likely in the Arctic and beyond.

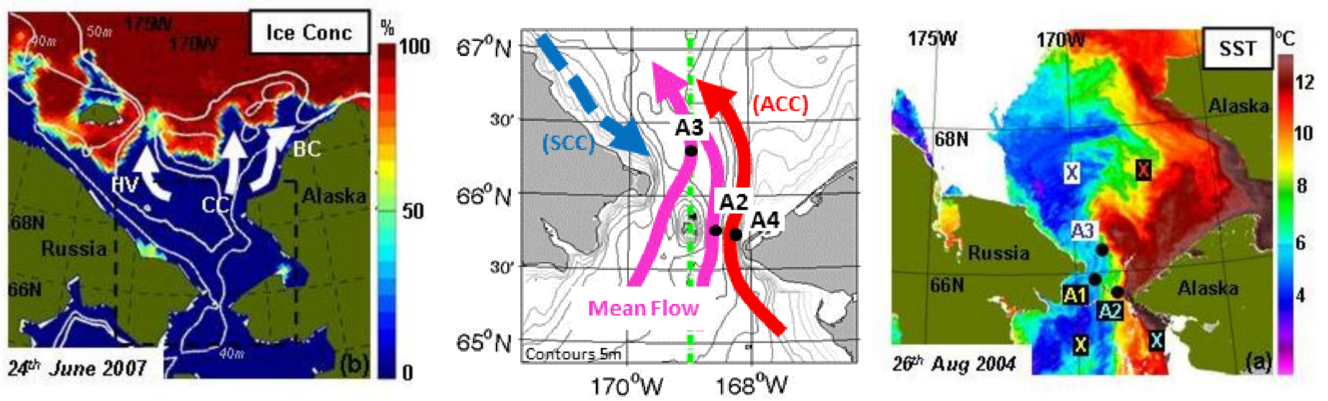


Figure 1: (Left) *Chukchi Sea ice concentration (AMSR-E) with schematic topography. White arrows mark three main water pathways melting back the ice edge [Woodgate et al., 2010].*
(Middle) *Detail of the Bering Strait, with schematic flows and mooring locations (black dots – A2, A3, A4). The main northward flow passes through both channels (magenta arrows). Topography diverts the western channel flow eastward near site A3. The warm, fresh Alaskan Coastal Current (ACC) (red arrow) is present seasonally in the east. The cold, fresh Siberian Coastal Current (SCC) (blue dashed arrow) is present in some years seasonally in the west. Green dashed line at 168º58.7'W marks the US-Russian EEZ (Exclusive Economic Zone) boundary. Note all moorings are in the US EEZ. Depth contours are from IBCAO [Jakobsson et al., 2000]. The Diomede Islands are in the center of the strait, seen here as small black dots on the green dashed line marking the US-Russian boundary.*
(Right) *Sea Surface Temperature (SST) MODIS/Aqua level 1 image from 26th August 2004 (courtesy of Ocean Color Data Processing Archive, NASA/Goddard Space Flight Center). White areas indicate clouds. Note the dominance of the warm ACC along the Alaskan Coast, and the suggestion of a cold SCC-like current along the Russian coast [Woodgate et al., 2006].*

Since 1990, year-round moorings have been maintained almost continually in the Bering Strait region, supported by typically annual servicing and hydrographic cruises. These data have allowed us to quantify seasonal and interannual change [*Woodgate et al.*, 2005b; *Woodgate et al.*, 2006; *Woodgate et al.*, 2010; *Woodgate et al.*, 2012], and assess the strong contribution of the Alaskan Coastal Current (ACC) to the fluxes through the strait [*Woodgate and Aagaard*, 2005]. These data also show that the Bering Strait throughflow increased ~50% from 2001 (~0.7Sv) to 2011 (~1.1Sv), driving heat and freshwater flux increases [*Woodgate et al.*, 2012]. While ~ 1/3rd of this change is attributable to weaker local winds, 2/3rds appears to be driven by basin-scale changes between the Pacific and the Arctic. Remote data (winds, SST) prove insufficient for quantifying variability, indicating interannual change can still only be assessed by in situ year-round measurements [*Woodgate et al.*, 2012]. Indeed, data from 2013 indicate a surprisingly low flow year.

The work to be accomplished/started on this cruise will extend this mooring time-series to summer 2015.

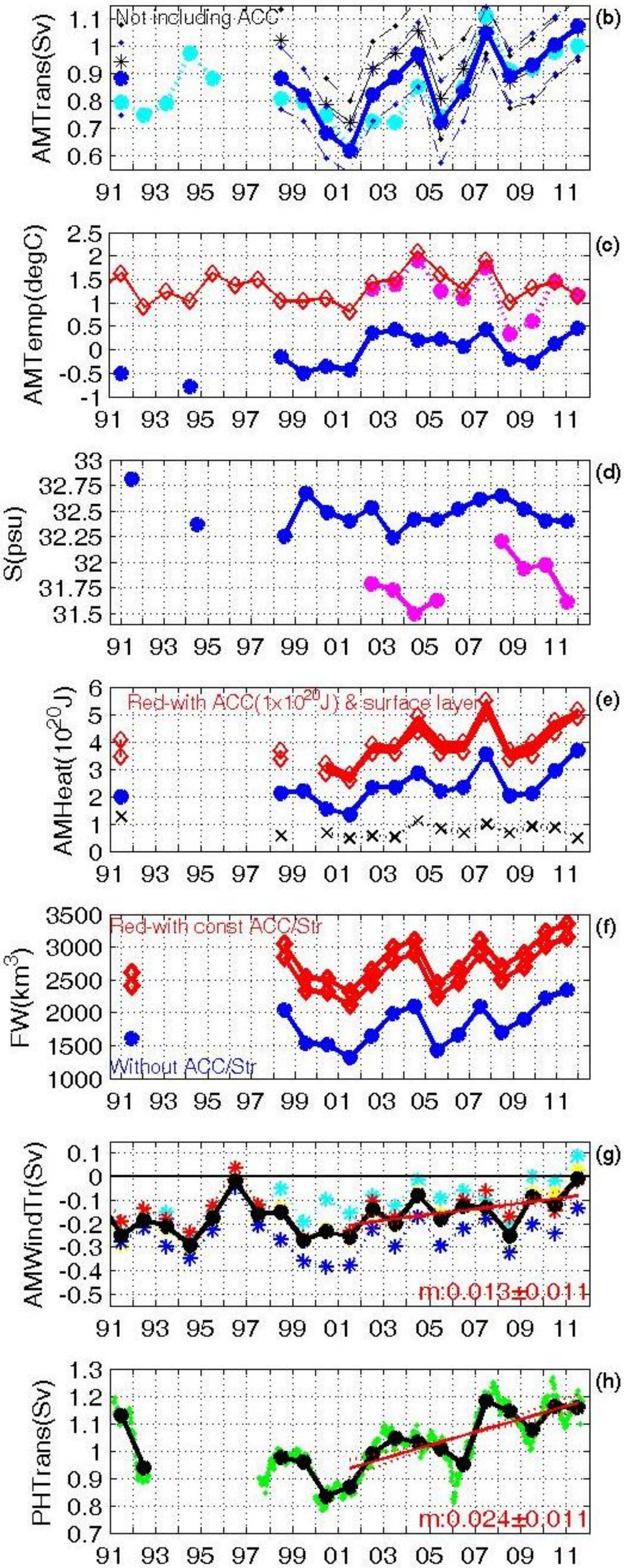


Figure 2, from [Woodgate et al., 2012]
a) map as per Figure 1.
b) *transport calculated from A3 (blue) or A2 (cyan), with error bars (dashed) calculated from variability; including adjustments estimated from 2007-2009 Acoustic Doppler Current Profiler data for 6-12m changes in instrument depth (black);*
c) *near-bottom temperatures from A3 (blue) and A4 (magenta-dashed), and the NOAA SST product (red diamonds);*
d) *salinities from A3 (blue) and A4 (magenta);*
e) *heat fluxes: blue - from A3 only; red – including ACC correction (1×10^{20}J) and contributions from surface layer of 10m (lower bound) or 20m (upper bound) at SST, with black x indicate heat added from 20m surface layer;*
f) *freshwater fluxes: blue – from A3 only; red – including 800-1000km^3 (lower and upper bounds) correction for stratification and ACC;*
g) *transport attributable to NCEP wind (heading 330º, i.e., northwestward) at each of 4 points (coloured X in **(a)**) and the average thereof (black); and*
h) *transport attributable to the pressure-head term from the annual (black) or weekly (green) fits.*
*Uncertainties are order 10-20%. Red lines on **(g)** and **(h)** indicate best fit for 2001-2011 (trends=m±error, in Sv/yr, error being the 95% confidence limit from a 1-sided Student's t-test).*

International links: Maintaining the time-series measurements in Bering is important to several national and international programs, e.g., the Arctic Observing Network (AON), started as part of the International Polar Year (IPY) effort; NSF's Freshwater Initiative (FWI) and Arctic Model Intercomparison Project (AOMIP), and the international Arctic SubArctic Ocean Fluxes (ASOF) program. For several years, the work was part of the RUSALCA (Russian-US Long Term Census of the Arctic). Some of the CTD lines are part of the international Distributed Biological Observatory (DBO) effort. The mooring work also supports regional studies in the area, by providing key boundary conditions for the Chukchi Shelf/Beaufort Sea region; a measure of integrated change in the Bering Sea, and an indicator of the role of Pacific Waters in the Arctic Ocean.

2014 CRUISE SUMMARY:

Weather conditions were reasonable for the cruise, although rarely good. Winds 15-20knots were common for most of the cruise – there was only one calm day, Saturday 5th July 2014. Fog was extremely frequent. On the first day in the strait (Tuesday 1st July 2014), sea state/wind was initially too high to attempt the mooring recoveries, and so calibration CTD casts were taken at the stations (first A4, then A2) while we waited for the weather to improve. By midmorning, the weather had improved sufficiently to attempt recovery. Mooring A2 released on first release command and was recovered without incident. Mooring A4 also released on first command and was recovered without incident. During the steam to mooring A3, the weather and visibility worsened, and though the pre recovery CTD cast was accomplished, we postponed the mooring operation till better weather and ran ADCP lines during the night. Wednesday 2nd July 2014 was also very foggy, and we waited until the fog cleared before attempting the operation, especially given the proximity of the Russian border and the possibility (found in previous years) of the mooring being significantly delayed from releasing or requiring dragging. Eventually the fog cleared sufficiently to attempt the operation, and mooring A3 released on first command and was quickly recovered. The weather being workable, all 3 moorings (A3, A2 and A4) were also redeployed that day (with calibration casts post deployment), and CTD operations commenced in the evening ~ 9pm local time. The rest of the cruise was spent with CTDing and ADCP sections. Including test casts for the CTD (7 in number (about half on deck) due to issues with the altimeter and the pump), a total of 219 CTD casts were taken during the cruise, repeating lines run in previous years and running a new line just south of the strait. Although winds were frequently high with sea state ~ 4-5ft, CTD operations were never interrupted by the weather. We left the Bering Strait region ~ 2240 local time on the evening of Sunday 6th July 2014, transiting to Nome for offload on Monday 7th July 2014. We arriving off Nome ~ 1040 local, but spent ~ 2hrs receiving 2 small boatloads of equipment at the request of the USCGC Healy, before docking and offloading.

Overall, the cruise accomplished (to the best of our knowledge) the most extensive quasi-synoptic spatial survey of the southern Chukchi Sea in almost a decade. Similar (though less extensive surveys were taken in 2011 and 2012 from the Khromov [*Woodgate and RUSALCA11ScienceTeam*, 2011; *Woodgate and RUSALCA12ScienceTeam*, 2012] and in 2013 from the Norseman II [*Woodgate and BeringStrait2013ScienceTeam*, 2013]. Prior to that the last extensive surveys were in 2003 and 2004 from the Alpha Helix [*Woodgate*, 2003; *Woodgate*, 2004]). Our 2014 cruise accomplished more stations due to a combination of extremely efficient CTD operations (including taking profiles only, no bottles, and the high winch speed ~ 1m/s). In addition to a large scale water mass survey of the region, the repeat of several lines (and several stations) during this or subsequent cruises this year will allow for quantification of temporal variability. The 2014 Bering Strait mooring cruise also completed the fourth high resolution (~ 1nm) survey of the eddying region just north of the Diomede Islands, this time with underway ship's ADCP and surface temperature and salinity.

This year's cruise took place early in the season, within days of the 2013 cruise. Through winds were northwards for most of the cruise, they turned southwards during the CCL line (the morning of on Saturday 65h July) and this allowed us to sample the Bering Strait line under two very different wind conditions, although the flow remained northwards in both situations.

For full station coverage, see map and listings below. Preliminary results are given in the various sections.

Summary of CTD lines.

BS (US portion) – the main Bering Strait line, run at the start and at the end of the cruise. This line has been occupied by past Bering Strait mooring cruises. US portion only run here. This line is usually ~ 2nm resolution. In the second running of this section, we decreased the station spacing to ~1nm to better resolve the structure in the strait.

DL – a high resolution (1nm in the southern part) line running north from the Diomede Islands to study the hypothesized eddy and mixing region north of the islands. This was run at the start and end of the cruise.

AL (US portion) – another previously-run line (~ 1.7nm resolution), just north of the Strait, running from the Russian coast, through the mooring site A3, to where the main channel of the strait shallows on the eastern (US) side. US portion only run here.

CS (US portion) – another cross strait line (~ 3.9nm resolution), run here from the US-Russian convention line (~168° 58.7'W) to Point Hope (US).

LIS – from Cape Lisburne towards the WNW, a previous RUSALCA line, run by us also in 2011, 2012 and 2013, and close to the CP line occupied in previous Bering Strait cruises in 2003 and 2004 (station spacing ~ 3.6nm).

CCL – a line running down the convention line (at ~ 10nm resolution) from the end of the LIS line towards the Diomedes (also run in 2003, 2004, 2011, 2012 and 2013), incorporating a rerun of the high resolution DL line at the southern end.

DLa and DLb – two other high resolution lines (1nm resolution), mapping the eddying/mixing region, parallel to DL, allowing for a 2-dimensional mapping of the region.

BS – the original BS line, rerun at ~ 1nm resolution at the end of the cruise.

SBS – a new line, run just south of the strait, crossing the Alaskan Coastal Current before it enters the strait proper (~ 2.2nm resolution).

Summary of ADCP lines

The ship's ADCP recorded for the duration of the cruise. Between mooring operations and some CTD lines, some lines were run exclusively for ADCP, viz

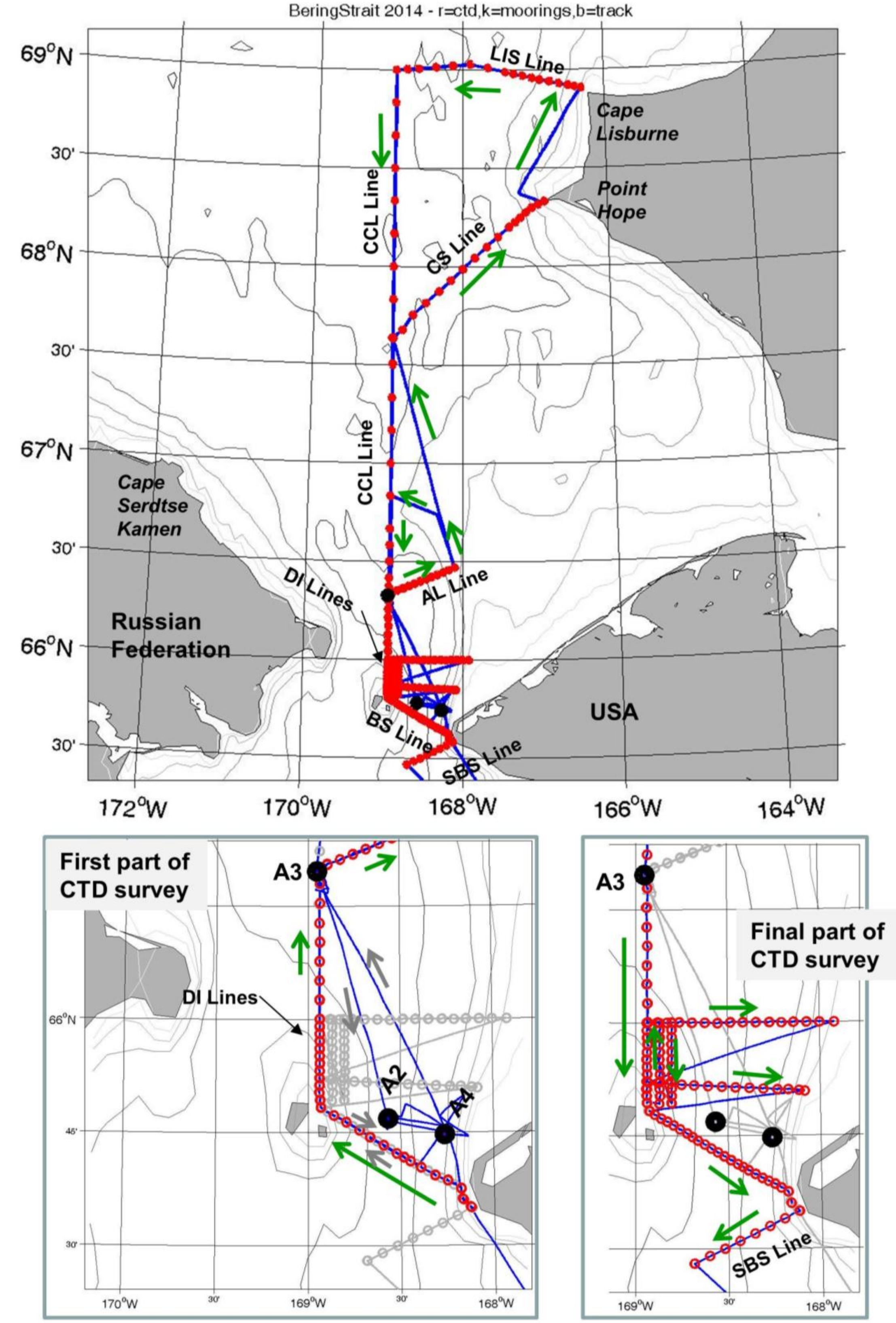
BS line – run at 7 knots east to west and mostly west to east, prior to mooring operations

AL line and part of **CHUK** line – box of lines run between A2 and A4 recovery and prior to A3 recovery, run at 7knots. (CHUK is an east-west line running SEE to NWW, connecting the end of the A3 line with the CCL line)

Cross strait lines run between east end of NBS and west end of MBS, and east end of MBS and west end of BS (both run at ~ 8knots).

Contents

BERING STRAIT 2014 MOORING CRUISE MAP: *Ship-track, blue. Mooring sites, black. CTD stations, red. Grey and green arrows indicate direction of travel (grey during mooring operations, green during CTD operations). Depth contours every 10m from the International Bathymetric Chart of the Arctic Ocean (IBCAO) [Jakobsson et al., 2000]. Lower panels give detail of strait region at the start (left) and end (right) of the cruise.*



BERING STRAIT 2014 SCIENCE PARTICIPANTS

1.	Rebecca Woodgate (F)	UW	*Chief Scientist*
2.	Jim Johnson (M)	UW	*UW Mooring Lead*
3.	Cecilia Peralta Ferriz (F)	UW	*UW Postdoc and CTD lead*
4.	An Nguyen (F)	MIT	*MIT Project PI, modeler and CTD work*
5.	Robert Daniels (M)	UW	*UW student, CTD and moorings*

UW – University of Washington, US
MIT – Massachusetts Institute of Technology, US

BERING STRAIT 2014 NORSEMAN II CREW

1.	Jack Molan (M)	NMC	*Captain*
2.	Jim Howard (M)	NMC	*Mate*
3.	Joanne Molan (F)	NMC	*Cook*
4.	Harry Burnett (M)	NMC	*Night Cook*
5.	Jim Wells (M)	NMC	*Deck Boss*
6.	Austin Church (M)	NMC	*Deck Hand*
7.	Zach Starrett (M)	NMC	*Deck Hand*
8.	Jorin Watson (M)	NMC	*Deck Hand*
9.	John Sankoh (M)	NMC	*Engineer*
10.	Andy Dyer (M)	SAE	*Health and Safety*

NMC – Norseman Maritime Charters, http://www.norsemanmaritime.com/index
SAE – SAExploration, http://www.saexploration.com/en

Ship contract arranged by
Olgoonik Fairweather LLC, http://www.fairweather.com/fairweatherscience.html

BERING STRAIT 2014 CRUISE SCHEDULE (Times Alaskan Daylight Time (GMT-8) 24hr format)

August 2013 to cruise	*Arrangement of charter of Norseman II by NSF and others for the Bering Strait mooring work*
End of April 2014	*Shipment of container of UW equipment to Nome, ETA mid-June*
Thursday 26th June 2014	*Science team (Rebecca, Jim, Cecilia, Robert, An) arrive Nome* *Port requests onload on Sunday 29th June, instead of Mon 30th June*
Friday 27th June 2014 *(Mild, sunny)*	*UW Instrument preparation (start instruments, build ADCPs, ISCATS)* *Rebecca gives talk at UAF-Nome for local community*
Saturday 28th June 2014 *(Overcast, choppy)*	*Restuff container* *Dan Naber arrives and preps UAF ISUS for deployment*
Sunday 29th June 2014 *(Overcast, swell)*	*Ship docks from previous charter* *Start our onload ~ 10:30am, done within a few hours* *Go ashore again to allow ship to prep* *Meeting with "Little Sisters" to view old Diomede video*
Monday 30th June 2014 *(Overcast, moderate wind)*	*On board for 6am departure, Safety briefing, throw lines 7:50am,* CTD tests and test casts Discussion of mooring and CTD operations Arrive strait too late for mooring work – run ADCP lines along BS
Tuesday 1st July 2014 *(Windy, with fog, wind falling during the day)*	On site A4-13 0730, CTD cast, postpone recovery for better weather On site A2-13 0900, CTD cast, postpone recovery for better weather On site A2-13 for recovery 1030, Finish recovery 1052 On site A4-13 for recovery 1230 Finish recovery 1243 Steam to A3-13, cleaning up mooring recoveries On site A3-13 1700 CTD cast, postpone recovery for better weather Run ADCP box section (A3, North, CHUCK, CCL back to A3) at night
Wednesday 2nd July 2014 *(Foggy, moderate wind)*	On site A3-13 0730, wait for fog On site A3-13 for recovery 0840, Finish recovery 0854 Prep for A3-14 deployment Start A3-14 deployment 1110, Finish deployment 1120 Calibration CTD cast at A3-14 Steam for A2-14, prepping A2-14, then cleaning A3 recovery Start A2-14 deployment 1645, Finish deployment 1655 Calibration CTD cast at A2-14 Steam for A4-14, prepping A4-14 Start A4-14 deployment 1819, Finish deployment 1826 Calibration CTD cast at A4-14 Steam to BS24 Start BSline 2051, running away from US (BS24-BS11)
Thursday 3rd July 2014 *(Foggy, moderate wind)*	End BS line 0134, Steam to DI1 Start DI line 0144, running north (DI1-19) End DI line 0644, Steam to A3-14 Start A3 line 0658, running towards US (A3-14 – AL24) End A3 line 1036, Steam to CS10US Start CS line 1804, running towards US (CS10US – CS19)

Friday 4th July 2014	End CS line 0303, Steam to LIZ 1 (up coast, avoiding shallows)
(Foggy, moderate wind)	Start LIZ line 0815, running away from US (LIZ1-14)
	End LIZ line 1555, Steam to CCL22
	Start CCL line 1619, running south (CCL22 – A3)
Saturday 5th July 2014	End CCL line 1334, Steam to line DI 19
(Start foggy, moderate wind,	Start DI line 1351, running south (DI19-DI1)
wind dropping to evening and	End line 1845, Steam to DLa1
turning to northwards,	Start DLa line 1901, running north (DLa1-DLa12)
fog clearing to evening,	End DLa line 2113, Steam to DLb12
except by islands)	Start DLb line 2127, running south (DLb12-DLb1)
	End line 2349, Steam to NBS1
	Science presentation on board between CTD casts
Sunday 6th July 2014	Start NBS line 0116, running towards US (NBS1-9 with 0.5)
(Wind increasing northward,	End NBS line 0523, Steam to MBSn1 at 8knots ADCPing
fog patchy, clearer towards	(Ship's underway system out for transit)
evening, seas rising)	Start MBSn line 0823, running towards US (MBSn1-MBSn8 with 0.5)
	End MBSn line 1202, Steam to BS11 at 8 knots ADCPing
	Start BS line 1444, running towards US with extra stats (BS11-BS24)
	End line 2002
	Start SBS line 2021, running away from US (SBS2-SBS8)
	End line 2238, Turn for Nome
Monday 7th July 2014	Off Nome by 1030
(Sunny, light winds, hot)	Transfer of 2 pallets of equipment from USCGC Healy (1030-1215)
	Dock ~ 1310
	Flat and Container at ship ~ 1430, start offload
	Offload finished 1610, Deliver Airfreight. Leave ship ~ 1700

TOTALS

7.2 days at sea (away from Nome) ***0750 30th June – 1310 7th July 2014***
7.5 days on ship (including on/offload) ***1030-1300 29th June, 0600 30th June – 1700 7th July 2014***

Moorings recovered/ deployed: ***3/3***
CTD casts: ***212+7 test casts (5 in water) = 219 CTD records.***

SCIENCE COMPONENTS OF CRUISE

The cruise comprised of the following science components:

- Mooring operations

- CTD operations

Line	Cast #s	# Stat	Dist (nm)	Time (hrs)	Start Time (GMT)	End Time (GMT)	Nm per Stat.	Hr per Stat.
Test casts	**1-7**	**7**						
Pre Recovery	**8-10**	**3**						
Post Deployment	**11-13**	**3**						
transit A4 to BS24			*10*	*2.25*				
CTD BS24-BS11	**14-28**	**14**	**25**	**4.75**	3rdJuly 2014 0451	3rd July 2014 0934	**1.92**	**0.34**
transit to Dl1			*0.25*	*0.17*				
CTD DL1-DL19	**29-47**	**19**	**30**	**5.00**	3rd July 2014 0944	3rd July 2014 1444	**1.67**	**0.26**
transit to A3			*3*	0.25				
CTD A3- AL24	**48-60**	**13**	**22**	**3.67**	3rd July 2014 1448	3rd July 2014 1836	**1.83**	**0.28**
transit to CS			*73*	7.50				
CTD CS10-CS19	**61-77**	**17**	**63**	**9.00**	4th July 2014 0204	4th July 2014 1103	**3.94**	**0.53**
transit to LIS			*37*	5.17				
CTD LIS1-14,CCL22	**78-95**	**17**	**58**	**8.08**	4th July 2014 1615	5th July 2014 0021	**3.63**	**0.48**
transit to CCL21			*10*	1.33				
CTD CCL21-A3	**96-114**	**18**	**152**	**19.83**	5th July 2014 0144	5th July 2014 2134	**8.94**	**1.10**
transit to DL19			*3*	*0.28*				
CTD DL19-DL1	**115-133**	**19**	**30**	**5.00**	5th July 2014 2151	6th July 2014 0245	**1.67**	**0.26**
transit to DLa1			*1.7*	*0.25*				
CTD DLa1-DLa12	**134-145**	**12**	**11**	**2.20**	6th July 2014 0301	6th July 2014 0513	**1.00**	**0.18**
transit to DLb12			*1.7*	*0.25*				
CTD DLb12B-DLb1	**146-157**	**12**	**11**	**2.33**	6th July 2014 0527	6th July 2014 0749	**1.00**	**0.19**
transit to NBS1			*11*	*1.42*				
CTD NBS1-NBS9	**158-173**	**17**	**27**	**4.27**	6th July 2014 0916	6th July 2014 1323	**1.69**	**0.25**
transit to MBSn1			*26.5*	*3.00*				
CTD MBSn1-MBSn8	**174-187**	**14**	**21**	**3.83**	6th July 2014 1623	6th July 2014 2002	**1.62**	**0.27**
transit to BS11			*21*	*2.70*				
CTD BS11-BS24	**188-212**	**25**	**25**	***5.27***	6th July 2014 2244	7th July 2014 0402	**1.04**	**0.21**
Transit to SBS2			*2.1*	*0.33*				
CTD SBS2to SBS8	**213-219**	**7**	**13.4**	**2.28**	7th July 2014 0421	7th July 2014 0219	**2.23**	**0.33**

- Underway sampling – ship-based equipment of 300kHz hull-mounted ADCP; SBE21 underway Temperature-Salinity recorder, and some meteorological data (air temperature, pressure, humidity, wind direction and wind speed).

MOORING OPERATIONS (Woodgate, Johnson, Peralta-Ferriz, Daniels, Nguyen)

Background: The moorings serviced on this cruise are part of a multi-year time-series (started in 1990) of measurements of the flow through the Bering Strait. This flow acts as a drain for the Bering Sea shelf, dominates the Chukchi Sea, influences the Arctic Ocean, and can be traced across the Arctic Ocean to the Fram Strait and beyond. The long-term monitoring of the inflow into the Arctic Ocean via the Bering Strait is important for understanding climatic change both locally and in the Arctic. Data from 2001 to 2011 suggest that heat and freshwater fluxes are increasing through the strait [*Woodgate et al.*, 2006; *Woodgate et al.*, 2010; *Woodgate et al.*, 2012], with 2012 being a year of low flow. The data recovered this cruise will indicate if 2013 shows further increase or a return to older conditions. An overview of the Bering Strait mooring work (including access to mooring and CTD data) is available at http://psc.apl.washington.edu/BeringStrait.html. A map of mooring stations is given above.

Three UW moorings were recovered on this cruise. These moorings (all in US waters – A2-13, A4-13, A3-13 were deployed from the Norseman II in July 2013, with mooring funding from ONR PI: Woodgate, *N00014-13-1-0468*) and ship-time support from NSF-AON and NOAA RUSALCA.

Three UW moorings (A3-14, A2-14, A4-14) were deployed on this 2014 Norseman II cruise under funding from NSF-AON (PI: Woodgate and Heimbach, *PLR1304052*). All these deployments were replacements of recovered moorings at sites occupied since at least 2001 (A4) or 1990 (A2 and A3). Analysis of past data suggests data from these three moorings are sufficient to give reasonable estimates of the physical fluxes of volume, heat and freshwater through the strait, as well as a useful measure of the spread of water properties (temperature and salinity) in the whole strait.

All moorings (recovered and deployed) carried upward-looking ADCPs (measuring water velocity in 2m bins up to the surface, ice motion, and medium quality ice-thickness); lower-level temperature-salinity sensors; and iscats (upper level temperature-salinity-pressure sensors in a trawl resistant housing designed to survive impact by ice keels). Two of the recovery sites (A2, central eastern channel; and A3, the climate site) also carry ISUS nitrate sensors and some biooptics. A single ISUS instrument was redeployed on A3-14. The three recovered moorings carried marine mammal acoustic recorders, and acoustic recorders were deployed on the three new moorings also. For a full instrument listing, see the table below.

This coverage should allow us to assess year-round stratification in and fluxes through the strait, including the contribution of the Alaskan Coastal Current, a warm, fresh current present seasonally in the eastern channel, and suggested to be a major part of the heat and freshwater fluxes [*Woodgate and Aagaard*, 2005; *Woodgate et al.*, 2006]. The ADCPs (which give an estimate of ice thickness and ice motion) allow the quantification of the movement of ice through the strait [*Travers*, 2012]. The nutrient sampler, the transmissometer, fluorometer and marine mammal recording time-series measurements should advance our understanding of the biological systems in the region.

Calibration Casts: Biofouling of instrumentation has been an on-going problem in the Bering Strait. Prior to each mooring recovery, a CTD cast was taken to allow for in situ comparison with mooring data. Similarly, CTD casts were taken at each mooring site immediately after deployment. These post-deployment casts will allow us to assess how effective this process is for pre-recovery calibration. Since the strait changes rapidly, and CTD casts are by necessity some 200m away from the mooring, it is inevitable that there will be differences between the water measured by the cast and that measured by the mooring. **Action item: On recovery, check the post deployment casts to see how reliable the comparison is.**

2014 Recoveries and Deployments: Mooring operations went very smoothly in 2014.

For recoveries, the ship positioned ~ 200m away from the mooring such as to drift towards the mooring site. Ranging was done from the port aft corner of the ship or directly aft of the ship, with the hydrophone connecting to the deck box inside at the aft end of the port laboratory. Without exception, acoustic ranges agreed to within 30m of the expected mooring position. Once the ship had drifted over the mooring and the acoustic ranges had increased to > 70m, the mooring was released. This procedure was followed to prevent the mooring being released too close (or underneath) the ship since in previous years the moorings have taken up to 15min to release.

All the moorings released immediately and were sighted at the surface within seconds of the confirmation of the release code. The recovered moorings were all equipped with springs in the release mechanism, to assist with freeing the mooring hook on release. It appears this function well, and thus the springs should be used in all future deployments. These springs were included in the 2014 deployments. **Action item: Use springs on all future mooring deployments.** Note that no problems were found with mooring releases on this cruise, even though only a short amount of chain (1m) is between the release and the anchor. This supports previous ideas that some mooring release issues related to the bottom pressure gauges on the mooring, rather than the shortness of the release to anchor distance. **Action item: Review Bottom Pressure Gauge design for future use**. Although biofouling was light, some biofouling was present on the release links, especially those painted with red paint – more success was found with the blue antifouling paint. ***Action items: Continue with biofouling paint on releases and with double releases, but check that paint does not foul the release or the spring.***

In all cases, once the mooring was on the surface, the ship repositioned, bringing the mooring tightly down the starboard side of the ship. One boat hook and a pole with a quick releasing hook attached to a line were used to catch the mooring, typically on a pear link fastened to the chain between the float and the ADCP. The line from the hook was then passed back to through the stern A-frame, and tied with a "cats paw" knot to a hook from the A-frame. This portion of the mooring was then elevated, allowing the second A-frame hook to be attached lower down the mooring chain, and tag lines to be attached if necessary. The iscat, if present, was recovered by hand at a convenient point in this operation, prior to recovery of most of the mooring. Then the entire mooring was then elevated and recovered onto deck. Recovery work was done by a deck team of 4 crew of the Norseman II – one on the A-frame controls, three on deck with on overhead safety lines ("dog runs") down each side of the deck (one of these working forward of the deck on tag line)s. Once on deck, the moorings were photographed to record biofouling and other issues. **Action items: be sure to add pear-link to the chain between float and ADCP; high A-frame or crane very helpful for recovery.**

The A-frame of the Norseman II is atypically high (~ 26ft less block attachments). While this is extremely useful in fair weather, it allows for swinging of the load in rougher seas. **Action item: Consider tag line options for recovery in rougher weather.**

Both fog and sea-state hindered mooring recoveries this year, although we had the opportunity to wait out both. Fog is a danger to mooring recoveries since the mooring may delay releasing due to biofouling, or the mooring may require dragging. Given the proximity of A3 to the US-Russian border, small boat operations may also be necessary during a dragging operation to prevent the surfaced mooring drifting out of the US EEZ. **Action item: Continue to include weather days in the cruise plan; plan also for small boat operations (including sending a battery powered release unit).** It is worth remembering that in calm seas, the ship's radar may be able to pick up the steel float on a surfaced mooring, and also that foggy conditions are more common near the islands.

Biofouling was moderate to light in the recoveries this year, with A4-13 being the most fouled as per last year. Fouling was by barnacles and bryozoan-like growth on several parts of the moorings. Overall though, release hooks were generally clear of biofouling, and, salinity cells were clear of biological growth. Note that the SBEs included in the ISUS instrument cage on A2-13 and A3-13 were only at a slight (~ 10deg) angle to the horizontal. **Action item: Check A2-13 and A3-13 optics SBE data for possible problem of slit gathering in cell, degrading salinity measurements as in past years (see data discussion below). Continue to mount SBEs as close to vertical as possible.**

Mooring deployments were done through the aft A-frame, using the A-frame hook for lifting. The height of the Norseman II A-frame was extremely advantageous for these deployments. Lacking such an A-frame, alternative ships might consider lifting the mooring with the crane, rather than the A-frame. The mooring was assembled completely within the A-frame. The ship positioned to steam slowly (~1 knots) into the wind/current, starting between 250m and 600m from the mooring site (the latter at A4 due to the stronger currents.) At the start of the deployment, the iscat was deployed by hand and allowed to stream behind the boat. The first pick was positioned below the ADCP, allowing most of the mooring to come off the deck during the first lift. Then, the A-frame boomed out to lower these instruments into the water. Tag lines were used to control the instruments in the air. **Action item: use deck cleats to fair tag lines rather than relying on body weight.** The first pick was released by a mechanical quick release, which was then repositioned to lift the anchor. Some issues were encountered in getting the releases off the deck after the first pick. If the pick was insufficiently high, the releases would still be on deck when the first package was in the water. The releases would then slip off the deck inelegantly. It was found (by the third deployment) that a higher lift of the instruments allowed the releases also to be lifted from the deck and then hang nicely behind the ship once the ADCP was placed in the water. The anchor was lifted into the water just prior to arriving at the site. When the ship arrived on site, the anchor was dropped using the mechanical quick release. Positions were taken from a hand-held GPS on the upper aft deck, some 5m from the drop point of the mooring. These positions match to within 30-60m of the ship's measurements of the GPS of the aft A-frame. **Action item: Continue to bring own GPS unit.** A team of 4-5 crew did the deployments, with one person on the A-frame, 3 on the "dog runs' assisting the instruments up into the air, and other members assisting with tending the quick release lines during lifting. The lines were passed off to the crew on the dog runs prior to deployment.

Action items: design pick points into the moorings for recover; continue to put 2 rings on the anchors for tag lines. Consider using chain, not line for the moorings (saves on splicing and gives extra pick points); Compute the best pick point, such that the releases are lifted free of the deck, rather than slipped over the edge.

Instrumentation issues: Most instrumentation was started in Nome or aboard ship in the days prior to sailing. All instrumentation was started successfully, using the older laptops. **Action item: Check new laptops with all instrumentation.** Iscat housings and ADCP frames were assembled using a team of 4 people in Nome (2 teams of 2). Although most of the mooring starts and building was accomplished in 1 day, the second day was necessary to restow the container and allow for unforeseen issues, and the 3rd day to allow for early loading, as was the case this year. The iscat loggers were equipped this year with again with lithium batteries. One coupler was found to not work. New software for the ADCPs was found to erase the bottom track measurements unless preventative steps were taken. **Action item: Start inventory numbers of the couplers, continue to test each coupler with an iscat prior to deployment. Find out about servicing/testing of couplers. Make sure all spare instruments contain batteries.**

Overall, data recovery on the moorings was excellent. All instruments were downloaded using the older laptops with serial ports. **Action item: Bring same number of laptops for these downloads.**

ISCAT SBE37IMS: Of the 3 iscats deployed on the recovered moorings, only 1 top sensors containing the inductive SBE37s (A3-13) was recovered. The recovered SBE37IM downloaded without incident, and returned a full data record. Both the lost iscats had broken predictably at the weak link. Logger data showed the iscats to have been lost on the 29th March 2014 at A2-13 and on the 13th May 2014 at A4-13.

ISCAT LOGGERS: All 3 loggers were operational on recovery. For the 2 systems where the iscat was lost (A2-13 and A4-13) the loggers (logger 24 on A2, and logger 21 on A4) yielded good data up to the presumed point of iscat loss. In each case, at one point during the deployment the logger failed to write one record. As the data are at 30 minute intervals and the clock drift is ~ 15min, this time discrepancy was neglected during data processing. This should be revisited if time accuracy of less than 1hr is required. The record from logger 04 on A3-13, although full length, contained several lines of erroneous data (,-55392.9179, -1.23695, -104730.687). Since the iscat was recovered, time was not taken to correct this logger record. **Action item: Investigate why logger 04 wrote erroneous data. Purchase new iscats for 2015 deployments. On recovery, check on the tightness of the IM couplers on the wire incase that is the cause of erroneous data.**

. **ADCPs:** All the 3 ADCPs recovered were still running on recovery, and all yielded good data on download. **Action item: do on shore checks of all compasses; use remaining battery to run tests on 2269, 12756, 13758**

SBEs: A seabird SBE16 was recovered from each mooring. None of these instruments were pumped. A4-13's SBE16 was in the usual vaned frame used by UW in the strait. A2-13's SBE was vaned on the marine mammal recorder on that mooring, a similar mounting to A4-13. On mooring A3-13, the SBE16 was deployed on the ADCP frame without vaning. All salinity cells were clear on recovery, although a preliminary comparison with recovery CTD casts suggests the salinities (calculated using the pre-mooring calibrations) have likely drifted erroneously fresh. Sizeable (up to 0.1 psu) changes over the year are not uncommon in past data, as the salinities cells are scoured by sediment. **Action item: revisit this once post-calibrations on the instruments (including the CTD casts) are complete.** Oddly, the SBE16instrument on A2-13 appears to read anomalously fresh (0.5psu) for ~ 2 months near the start of the deployment compared to other sensors on the mooring. **Action item: Investigate this.**

In addition, moorings A2-13 and A3-13 also carried SBE16plus instruments, duplicating temperature and salinity records and including also some optical sensors (A2-13- PAR and Wetlabs Flntus sensor with biowiper; A3-13 – fluorometer). These instruments were pumped but were mounted ~ 10deg from horizontal, and there have been issues in the past with salinity cells becoming blocked with sediment causing salinity drift. A preliminary comparison suggests this is certainly an issue on A2-13, where the SBE16plus instrument is reading under 30psu by the time of recovery, compared to 31.5 and 31.7psu from the SBE16 and the CTD cast respectively. **Action item: Revisit this once the post-cruise calibration are complete.** At the time of writing, no study has been made of the biological data from these instruments. Calibration information for these sensors is not available to us currently and the biooptic data are not included in this report. In both cases, the sensors appeared clean on recovery, but note that the biowiper on A2-13 (4112) was jammed open. **Action item: Investigate the biooptics data.** Note also, the SBE16plus on A3-13 (7052) was set to record at 0030, 0130, 0230 etc rather than on the usual whole hour. Also the SBE16plus on A2-13 (4112) appeared to have a much earlier data point at the start of the record, however by nominally adjusting this start time it is possible to obtain a good match of timestamps with in the water times.

Action items: Do more thorough comparison of salinities with CTD casts and consecutive moorings. Revisit all prior salinity records. Mount SBEs vertically. Clean cells on instruments.

A preliminary review of the SBE data show annual cycles of temperature and salinity. Direct comparison with older data is necessary to ascertain if preliminary indications of freshening from previous years is significant.

Other Instrumentation: Other instrumentation on the moorings were recovered for other groups. These instruments are:

ISUS nitrate sensors on A2-13 (#124) and A3-13(#250). These instruments were deployed by Dan Naber on behalf of Terry Whitledge, UAF. The A2-13 ISUS (#124) ran successfully for the whole deployment. The A3-13 ISUS (#250) had good data until 1st January 2014, when it appears the battery failed.

Aural Marine Mammal Acoustic sensors on A2-13 (#235), A4-13(#234) and A3-13 (#233). These instruments were deployed by Kate Stafford, (UW). At the time of writing, we have no information as to how these instrument ran.

Details of mooring positions and instrumentation are given below, along with schematics of the moorings, photos of the mooring fouling, and preliminary plots of the data as available.

BERING STRAIT 2014 MOORING POSITIONS AND INSTRUMENTATION

ID	LATITUDE (N) (WGS-84)	LONGITUDE (W) (WGS-84)	WATER DEPTH /m (corrected)	INST.
2013 Mooring Recoveries				
A2-13	65 46.86	168 34.05	56	ISCAT, ADCP, SBE16+Fl+PAR with ISUS, SBE16 with MMR
A4-13	65 44.75	168 15.75	49	ISCAT, ADCP, SBE16, MMR
A3-13	66 19.62	168 57.06	58	ISCAT, ADCP with SBE16, SBE16+Fl with ISUS, MMR

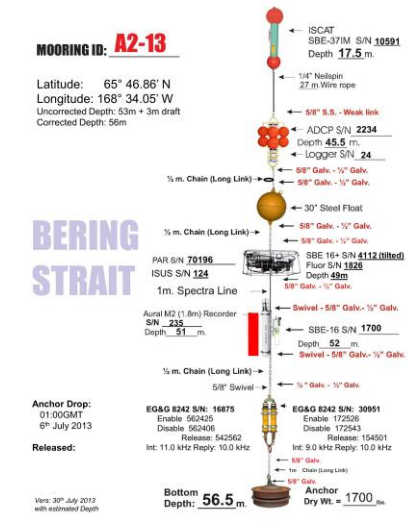
ID	LATITUDE (N) (WGS-84)	LONGITUDE (W) (WGS-84)	WATER DEPTH /m (corrected)	INST.
2014 Mooring Deployments				
A2-14	65 46.85	168 34.09	56	ISCAT, ADCP, SBE16 with MMR
A4-14	65 44.72	168 15.82	49	ISCAT, ADCP, SBE16, MMR
A3-14	66 19.60	168 57.06	58	ISCAT, ADCP with SBE16, SBE16 with ISUS, MMR

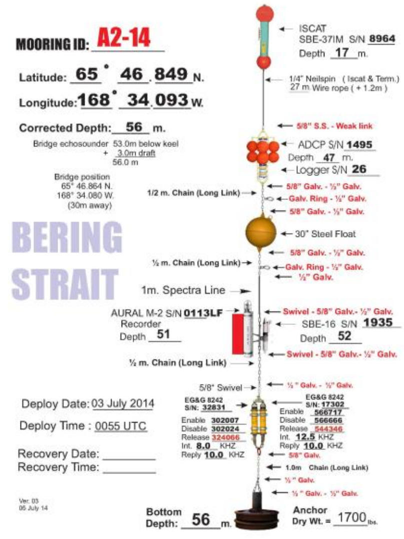
ADCP = RDI Acoustic Doppler Current Profiler
FL=Wetlabs Biowiper Fluorescence & just Fluorescence; PAR=Photosynthetically active radiation
ISCAT = near-surface Seabird TS sensor in trawl resistant housing, with near-bottom data logger
ISUS= Nutrient Analyzer
SBE16 = Seabird CTD recorder SBE16+ = Seabird CTD 16plus recorder
MMR=Marine Mammal Recorder

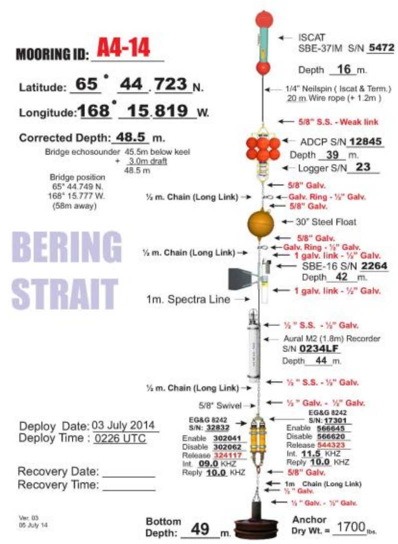
BERING STRAIT 2014 SCHEMATICS OF MOORING RECOVERIES AND DEPLOYMENTS

RECOVERED **DEPLOYED**

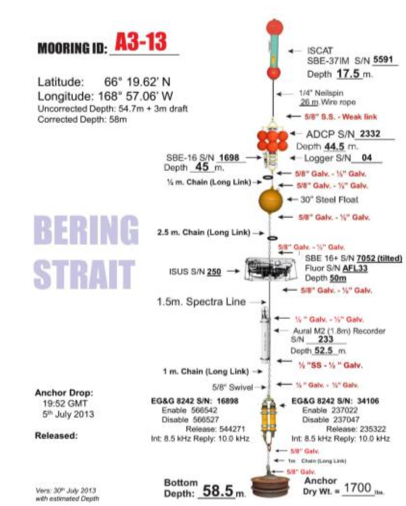
= in the eastern channel of the Bering Strait

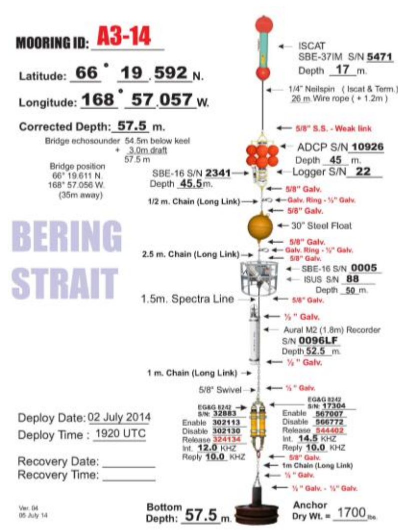






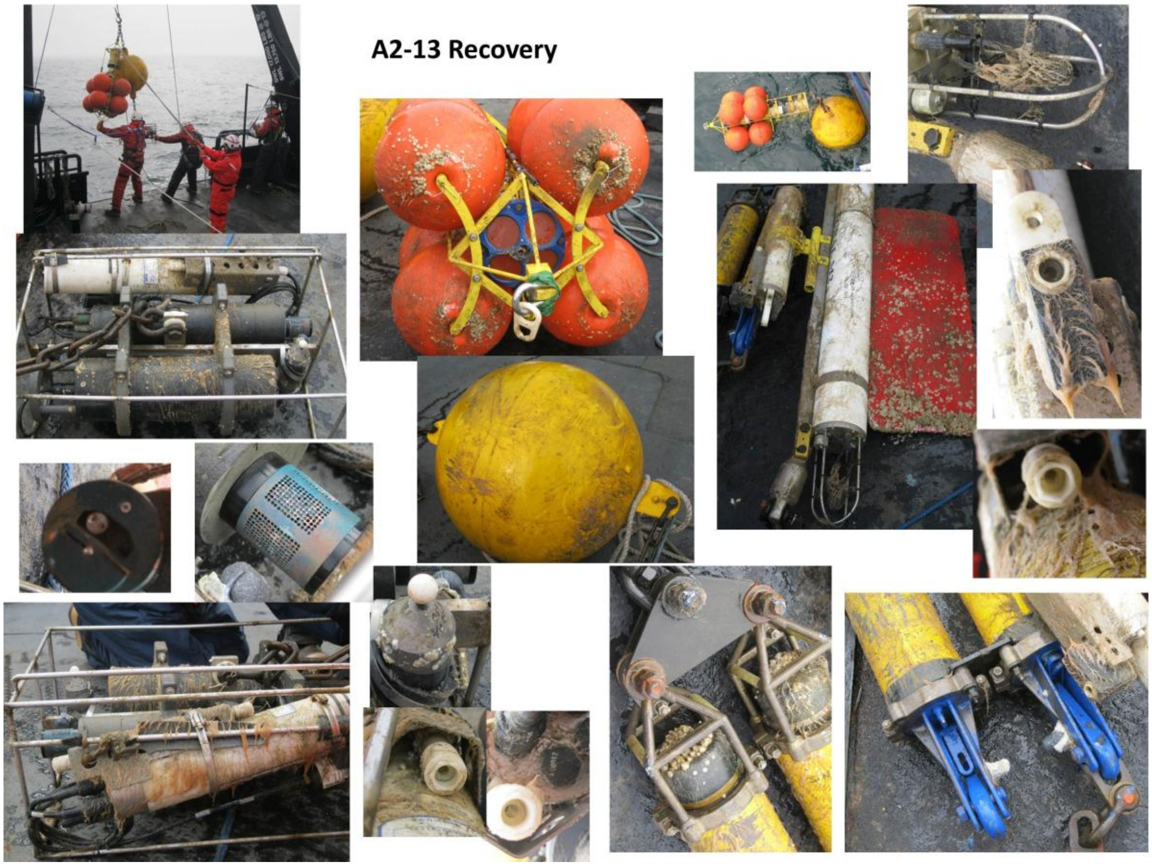
= at the climate site, ~ 60km north of the Strait

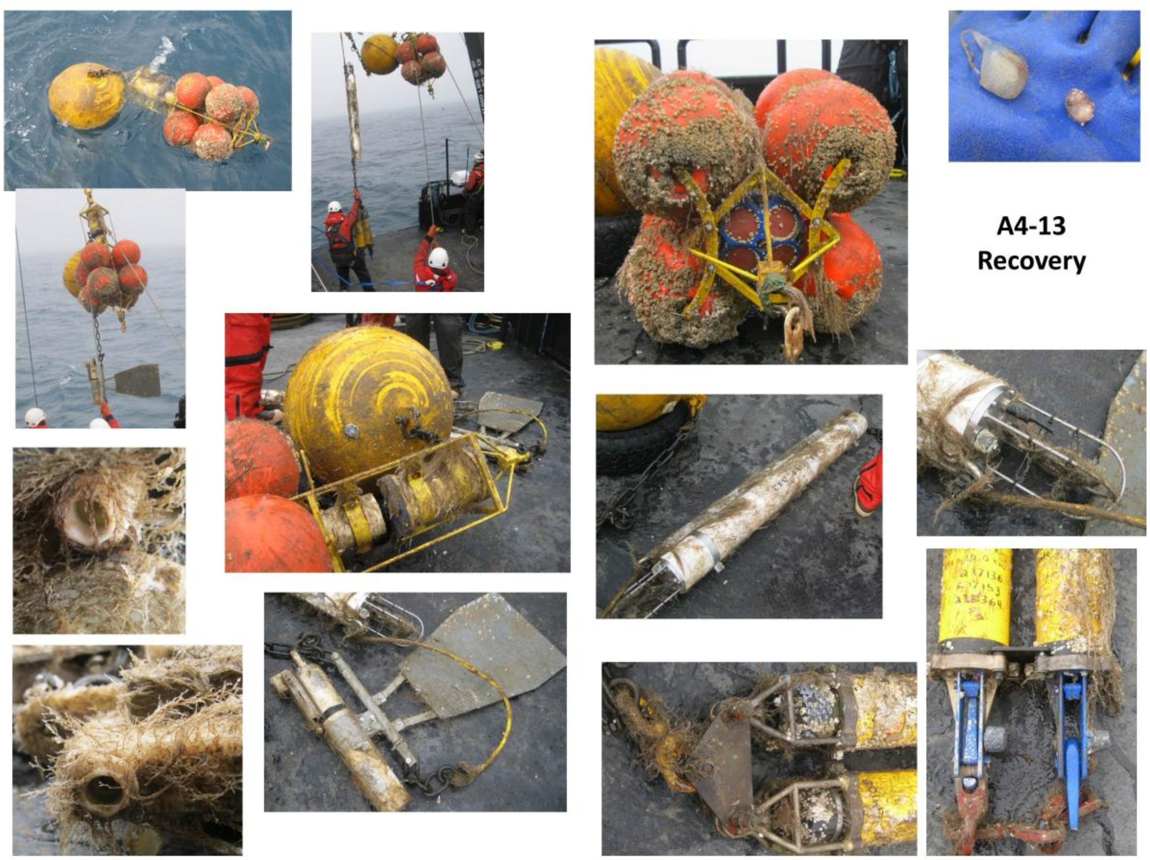




BERING STRAIT 2014 RECOVERY PHOTOS

A2-13 Recovery





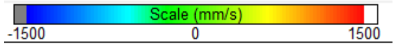
A4-13 Recovery

BERING STRAIT 2014 RECOVERY PHOTOS (continued)

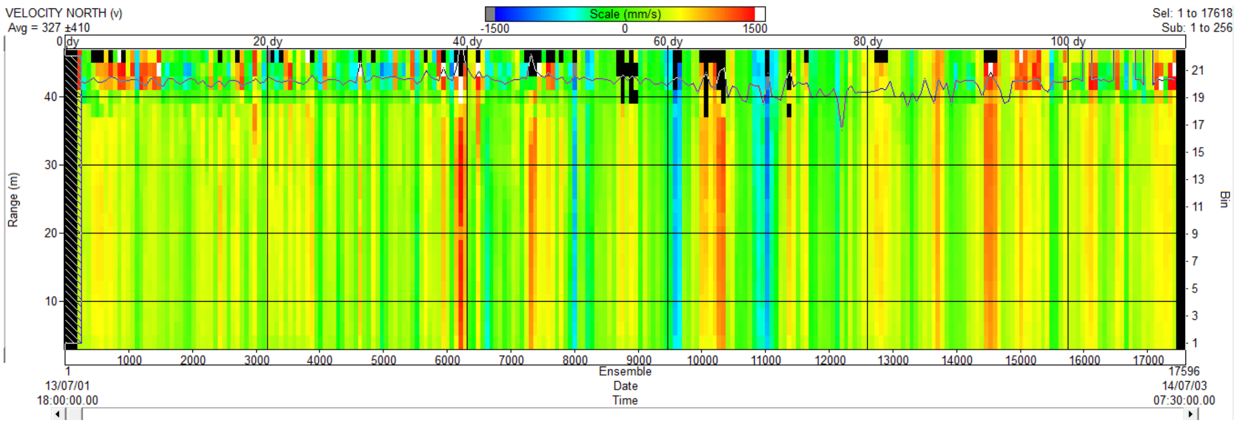
A3-13 Recovery

BERING STRAIT 2014 PRELIMINARY ADCP RESULTS

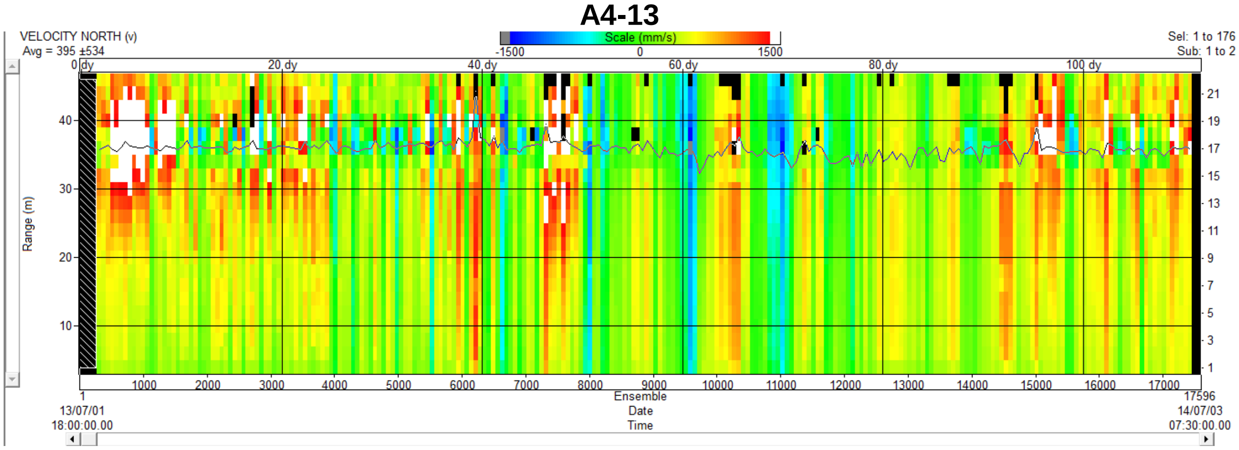
- NORTHWARD VELOCITY from ADCPs



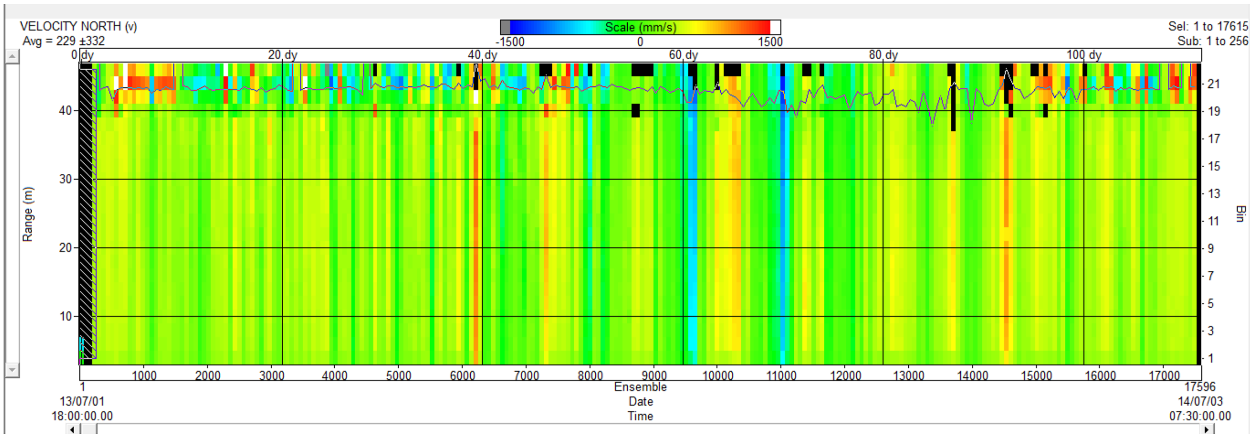
A2-13



A4-13



A3-13



BERING STRAIT 2014 SBE PRELIMINARY RESULTS

Comparison of SBEs on A2-13 and A3-13, using Precruise calibrations 13th July 2014

=======================A3-13==

UW SBE16 1698 ADCPframe Notvaned Not pumped 45m precal Dec12
UAF SBE16p 7052 ISUSframe, Hz Notvaned Pumped 50m precal Apr12
%---

Deployment comparison CTD BStrait2013 Cast number 8 (after shipboard correction) 5th July 2013, 2001-2018

Pres(db)	*Temp(DegC)*	*Sal(psu)*	*Density(kg/m3)*	*Depth(m)*
45.212	*0.8181*	*32.2977*	*1026.0986*	*44.760*
50.293	*0.8184*	*32.2977*	*1026.1227*	*49.789*

SBE First record SBE1698 at 45m

TIME(GMT) Press (db) Temp (DegC) Salinity(psu)
2013 07 05 20 00 45.05 45.09 44.64 0.824 32.309

SBE First record SBE7052 at 50m (NB 30min later)

TIME(GMT) Press (db) Temp (DegC) Salinity(psu)
2013 07 05 20 30 49.11 49.11 48.62 0.784 32.306

%---

CONCLUDE: Both records show temperature and salinities falling
- TEMP: 50m cooler as later, but both span CTD reading (within0.006degC at same time)
- SALINITY: within 0.01psu

%---
%---

Recovery comparison CTD Bstrait 2014 Cast number10 (after shipboard correction) 2nd July 2014 0102 (Dual senors)

Pres(db)	*Temp(DegC)*		*Sal(psu)*		*Density(kg/m3)*	
45.000	*1.4671*	*1.4680*	*32.5452*	*32.5351*	*1026.2556*	*1026.2475*
50.000	*1.4473*	*1.4524*	*32.5445*	*32.5337*	*1026.2801*	*1026.2711*

SBE Record SBE1698 at 45m

TIME(GMT) Press (db) Temp (DegC) Salinity(psu)
2014 07 02 01 11 45.08 45.12 44.67 1.461 32.144

SBE Record SBE7052 at 50m (NB 30min off whole hour)

TIME(GMT) Press (db) Temp (DegC) Salinity(psu)
2014 07 02 00 30 49.16 49.17 48.68 1.401 32.488
2014 07 02 01 30 49.12 49.13 48.64 1.543 32.492

%---

CONCLUDE:
- TEMP: agree well (Note warming and lies between 2 readings at 50m) (within 0.01degC at same time)
- SALINITY: CTD is saltier than both measurements 32.54, and 45m is fresher 32.1 versus 50m 32.49. It appears that both moored SBEs are drifting fresh. **ACTION ITEM: revisit this with postcals from SBES.**

%---

A313sbecomparison.jpg, plotted in sberecover plot2014sbefiles.m

=======================A2-13==

UAF	SBE16p	4112	ISUSframe, Hz	Notvaned	Pumped	48m	precal Sep10
UW	SBE16	1700	Own frame	Vaned	Not pumped	50m	precal Nov12

%--

Deployment comparison CTDs BStrait2013 Cast number 9 (after shipboard correction)
6th July 2013, 0105 0115

Pres(db)	*Temp(DegC)*	*Sal(psu)*	*Density(kg/m3)*	*Depth(m)*
48.337	*0.6070*	*32.2249*	*1026.0667*	*47.855*
49.868	*0.6073*	*32.2245*	*1026.0738*	*49.370*

SBE First record SBE4112 at 48m

TIME(GMT)	*Press (db)*			*Temp (DegC)*	*Salinity(psu)*
2013 07 06 01 04	48.00	0.00	0.00	0.608	32.255
2013 07 06 02 04	48.00	0.00	0.00	0.579	32.253

SBE First record SBE1700 at 50m

	TIME	*Press*			*Temp*		*salinity*	
74	2013 07 06 01 00	34.68	34.80	34.45	0.637	2.7516	32.288	187.0417
75	2013 07 06 02 00	49.60	49.72	49.22	0.578	2.7423	32.220	187.0834

%--

CONCLUDE: Both records show temperature and salinities falling
- TEMP: same by 0200, both colder than CTD, but were probably warmer during CTD.
(within0.001degC at same time, and within0.02degC within an hour)
- SALINITY: upper instrument starts saltier than both 50m and CTD. Suspect upper instrument cal is wrong as cal is old.

%--
%--

Recovery comparison CTD Bstrait 2014 Cast number9 (after shipboard correction)
1st July 2014 1658 1701

Pres(db)	*Temp(DegC)*		*Sal(psu)*		*Density(kg/m3)*	
48.000	*1.0930*	*1.0975*	*31.7305*	*31.7172*	*1025.6398*	*1025.6289*
49.000	*1.0932*	*1.0978*	*31.7305*	*31.7174*	*1025.6447*	*1025.6338*
50.000	*1.0927*	*1.0976*	*31.7299*	*31.7172*	*1025.6489*	*1025.6384*

SBE Record SBE4112 at 48m

TIME(GMT)	*Press (db)*			*Temp (DegC)*	*Salinity(psu)*
2014 07 01 16 04	48.00	0.00	0.00	0.993	29.212
2014 07 01 17 04	48.00	0.00	0.00	1.080	29.238
2014 07 01 18 04	48.00	0.00	0.00	1.126	29.253

SBE Record SBE1700 at 50m

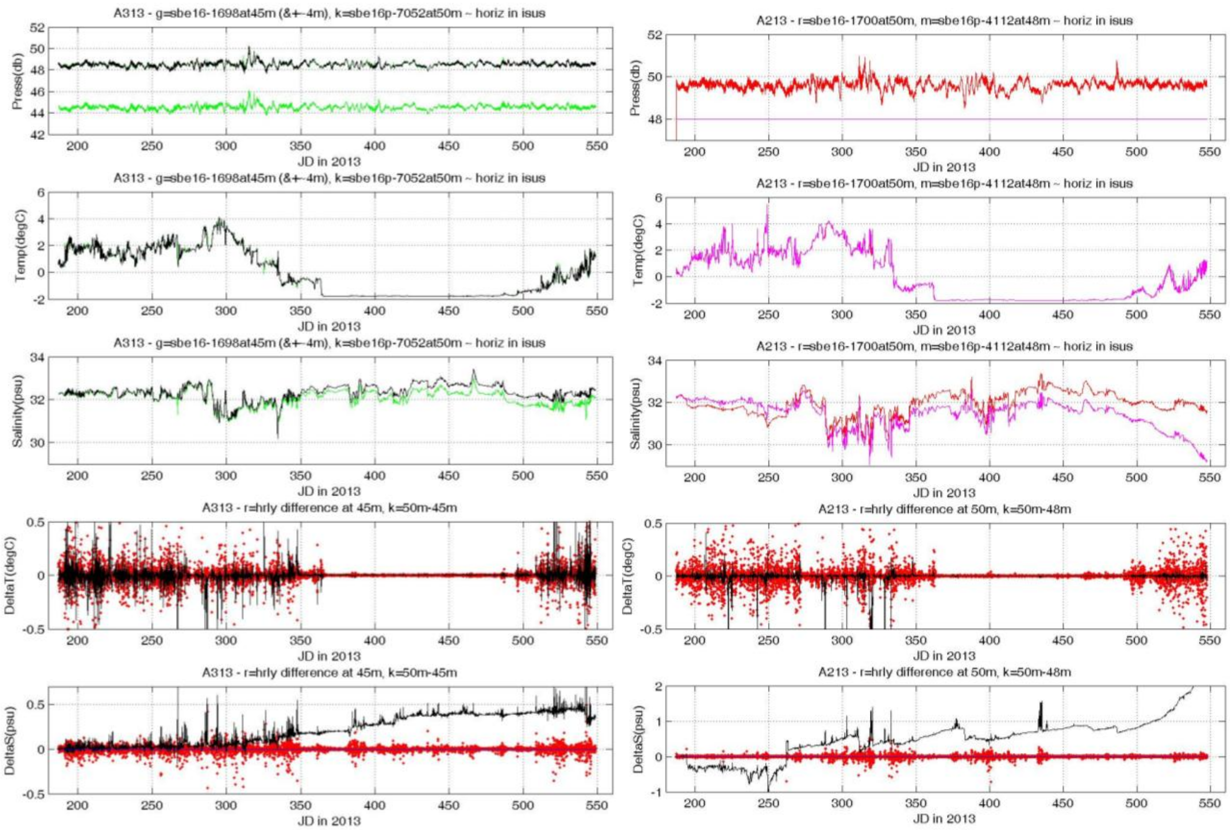
	TIME	*Press*			*Temp*		*salinity*	
8729	2014 07 01 16 12	49.53	49.65	49.16	0.992	2.7214	31.527	547.6750
8730	2014 07 01 17 12	49.55	49.67	49.18	1.081	2.7314	31.565	547.7166
8731	2014 07 01 18 12	49.54	49.66	49.17	1.121	2.7359	31.580	547.7583

%--

CONCLUDE:
- TEMP: agree well - between instruments 0.005degC, and to CTD 0.01deg C
- SALINITY: CTD is saltier than both measurements 31.73, with 50m record being 31.565 and 48m being far too fresh at 29.25.

It appears that both moored SBEs are drifting fresh, horizontal one especially so. **ACTION ITEM: revisit this with postcals from SBES.**

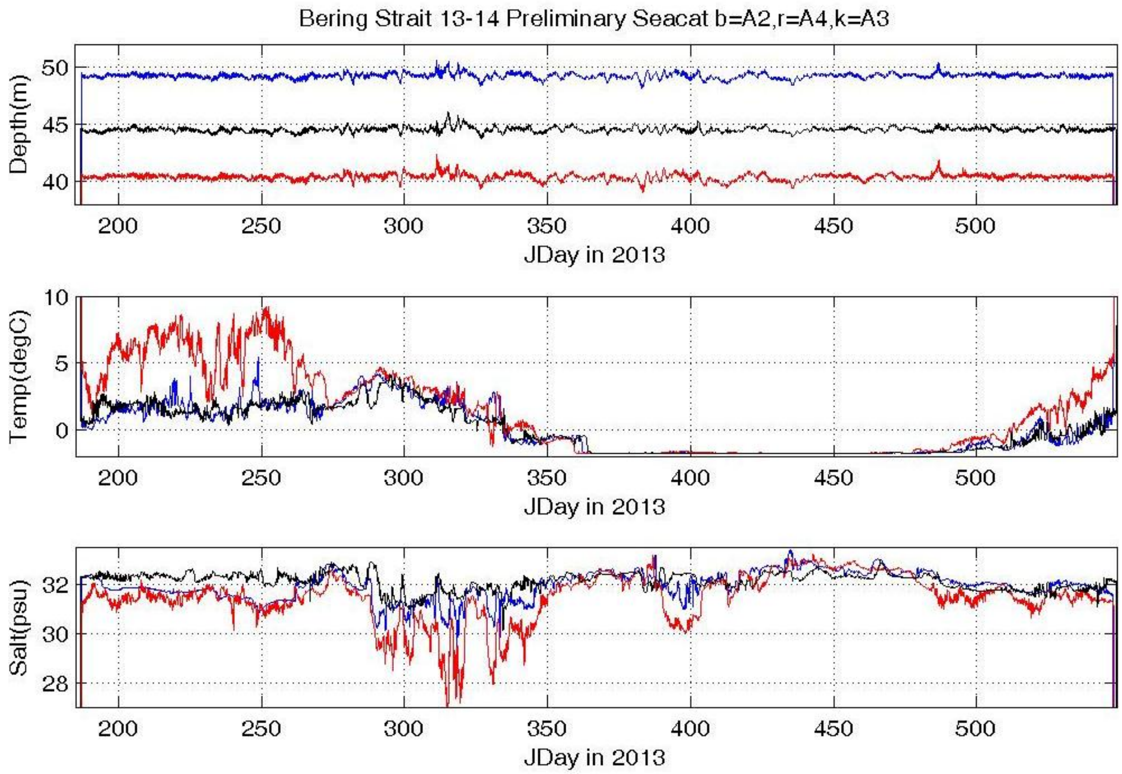
ACTION ITEM. For about 2 months, SBE at 50m (1700) is ~ 0.5psu too fresh for some reason. Investigate this also.

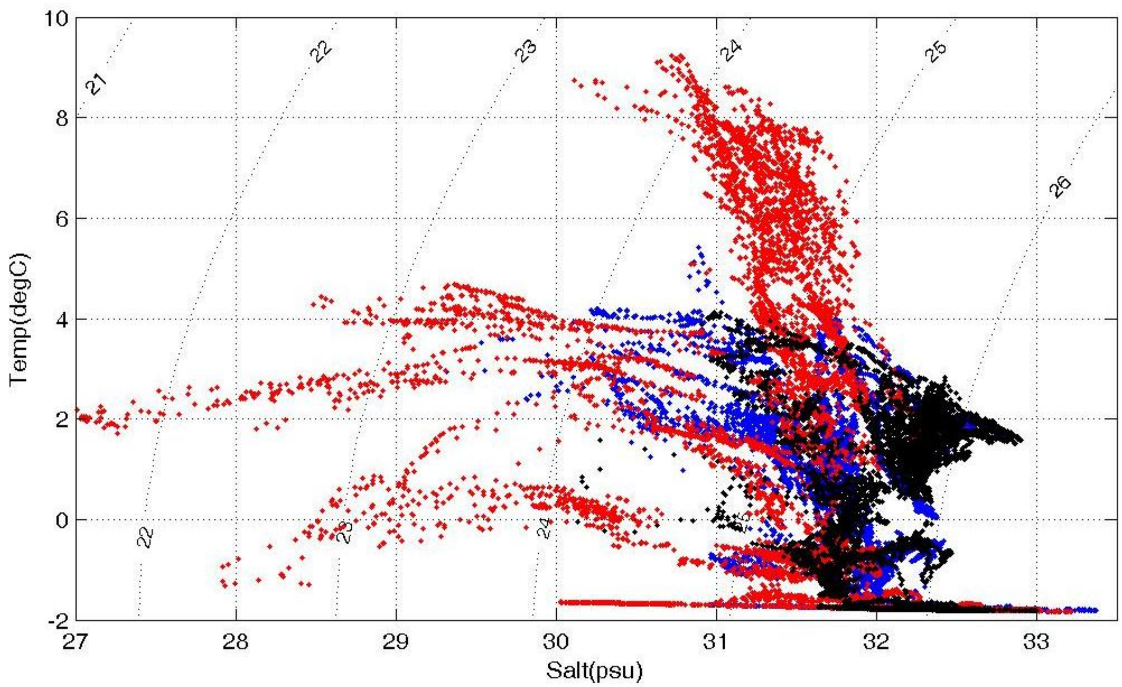


A213sbecomparison.jpg, plotted in sberecover plot2014sbefiles.m

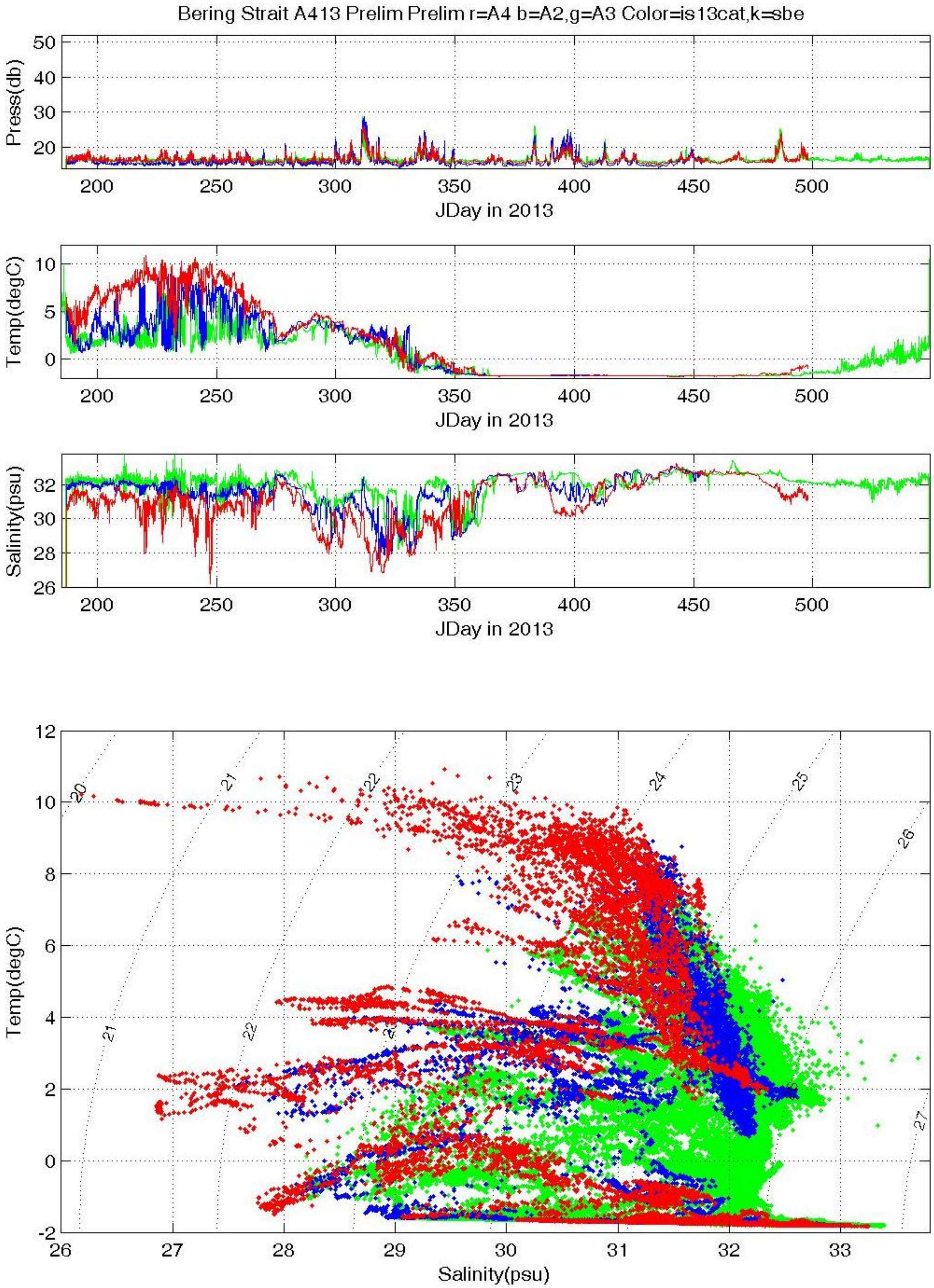
BERING STRAIT 2014 PRELIMINARY SBE RESULTS

– all lower level TS Sensors



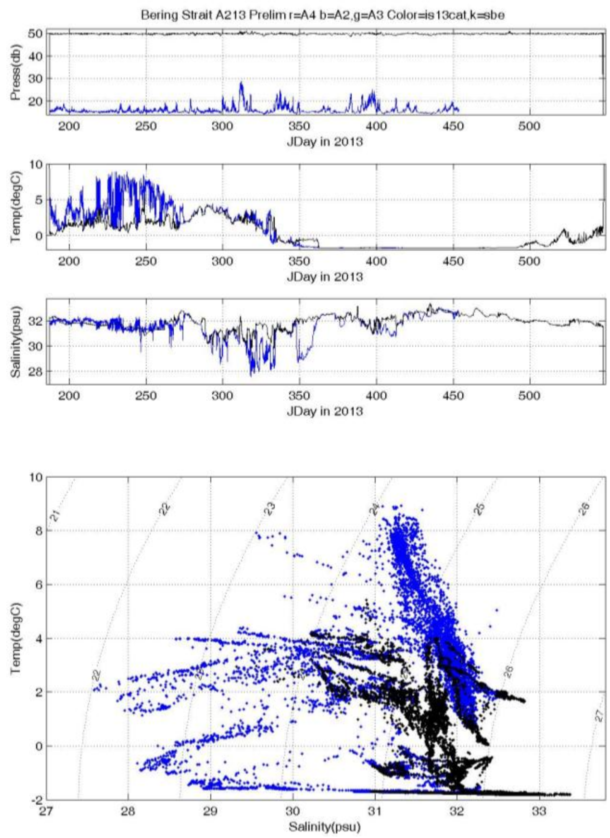


BERING STRAIT 2014 PRELIMINARY ISCAT RESULTS

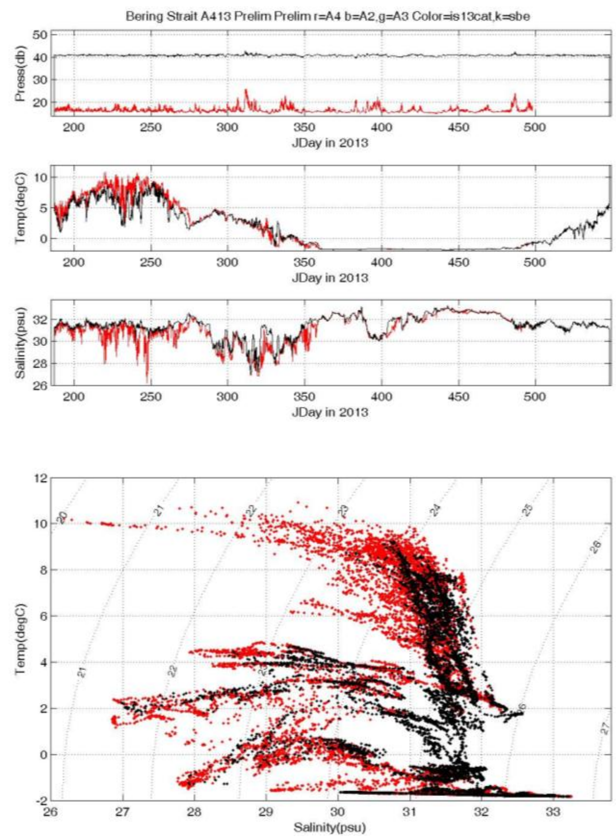


BERING STRAIT 2014 PRELIMINARY ISCAT AND SBE RESULTS (per mooring)

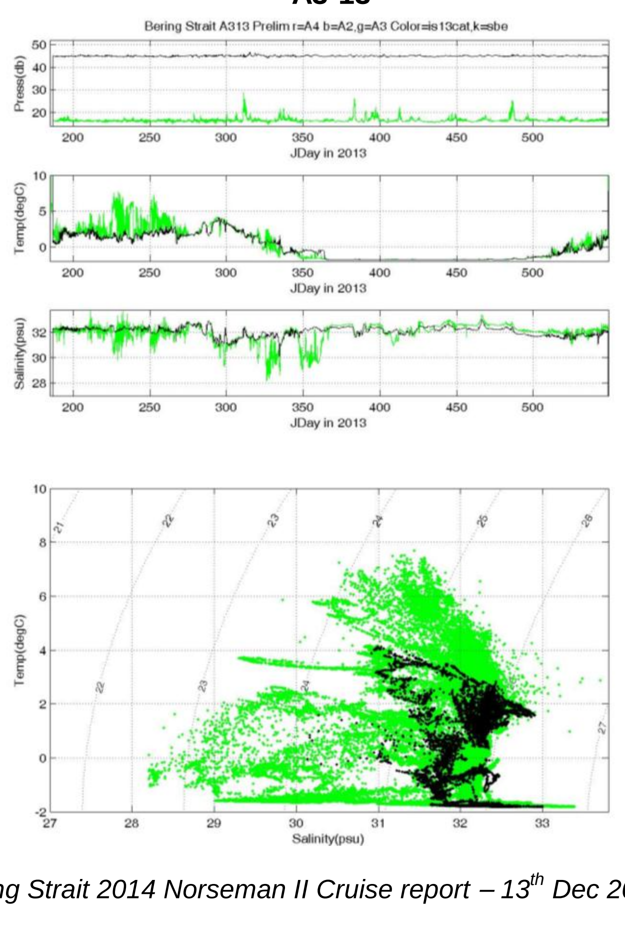
A2-13



A4-13



A3-13



CTD OPERATIONS (Peralta-Ferriz, Woodgate, Daniels,Nguyen, Johnson)

As in previous years, the moorings were supported by annual CTD sections, although in contrast to previous years, no water samples were taken during the cruise.

The CTD rosette system used on this cruise was loaned APL-UW. The full package consisted of:

One SBE9+ with pressure sensor (SN5915 – calibration 8th April 2010)
Two SBE3 temperature sensors (SN0843, SN0844 – calibration 23rd Feb 2012)
Two SBE4 conductivity sensors (SN0484, SN0485 – calibration 6th March &23rd Feb 2012)
Two SBE43 oxygen sensors (SN1753, SN1754 – calibration 22nd March & 14th March 2014)
One Wetlabs FLNTURT fluoresence/turbidity sensor (SN1622 – calibration 11th March 2010)
One Benthos Altimeter (SN50485)
Two Seabird pumps (SN0340, SN5236)
One ORE Offshore pinger UAT-376 (SN1933)

The temperature, conductivity and oxygen probes were paired as

	Temperature	Conductivity	Oxygen	Pump
Primary	#843	#484	#1753	50-02-05-0340
Secondary	#844	#485	#1754	5T-90543-05-5236

with a y-like connection system, whereby the exit vent of the loop was at the same depth as the intake as per recommendation from the manufacturer. The top of the Y contained a slow leak valve to keep the system sea-water primed on removal from the water. Tests in Seattle and at sea showed air in the system was expunged after ~ 45s of emersion in water.

All instruments were housed in one frame (see below), weighted with diving weights to ensure a close-to-vertical cast. In this trial format, weights were attached by lashing. Initially the CTD was weighted with 20lbs of weight. With this weight, the difference between wire out and change in pressure was ~ 2-3m in a 50m cast. The weight was increased to 40lbs. This did not noticeable alter the difference between wire out and change in instrument pressure, but the greater weight was used for the rest of the cruise. **ACTION ITEM: Revisit fastening of weights to the frame.**

The CTD was connected to a conducting wire winch on the ship. This winch (Rapp Hydema NW, SOW 160 5000m capacity, with 3 conductor 0.322"diameter wire), was new this year on the Norseman II. Chris Siani, APL, assisted with wiring and CTD tests of this system while the ship was in Seattle in May 2014. The winch was connected to an SBE11 deckbox, which in turn was linked via serial ports and USB-serial connectors to a dedicated PC, running the software package Seasave v7. Data were recorded in standard hexadecimal SBE format, incorporating NMEA GPS input from the Norseman II aft A-frame. An event log was maintained on the CTD computer. The log, and data files (and a screen dump of the cast) were copied to a thumb drive as a backup after each cast.

The CTD console was set on the port side of the interior lab. The package was deployed through the aft A-frame using a special block supplied by the ship. Although a Pentagon ULT unit had been mounted inside by the CTD console for lowering and raising the CTD, in practice, the winch driving was done by a crew member on deck, directed by the CTD operator using radio commands. This was deemed more efficient given the shortness of the casts (50m or less).

The A-frame was set slightly outboard and not repositioned during the cast - the package was lifted to the height of the aft rail of the ship by the winch, and swung inboard by hand. For the casts done during mooring operations, the CTD was hand-carried forward after each cast to the port-forward corner of the aft-deck, to clear the aft-deck for mooring work. Once all the mooring work was complete, the CTD package was kept at the rail.

The winch appeared to have only one speed (1m/s). This was used throughout the cruise (resulting in extremely speedy CTD operations), however, a slower (~ 0.5m/s) speed would be more appropriate for data collection on these casts. **ACTION ITEM. Investigate if a slower winch speed is possible.** Overall, although operations were successful and speedy, there appeared also to be little flexibility in the winch speed during recovery and deployment of the CTD (i.e., the system was either on at full speed, or off). Since the A-frame and block are high on this ship, this situation was workable although with a longer package, there could be some danger of blocking the instrument on recovery. **ACTION ITEM: Investigate more subtle ways of controlling winch speed for deployment and recovery**. Towards the end of the cruise, it was found that power surges from the winch were causing other electrical problems (blowing surge protectors) in other circuits on the ship. This was addressed by moving the winch control onto a separate circuit. **ACTION ITEM: Investigate electrical effects of winch surging**.

Once mooring work was complete, CTD operations were run 24hrs, using a team (per watch) of 1 science team member driving the CTD, and 2 ship's crew on deck (one driving the winch, one recovering the instrument). The efficiency of the crew made for very speedy CTD operations, and combined with the fast winch speed, resulted in record low times for running lines (see table above).

The turbidity sensor was cleaned by rinsing with soapy water and freshwater and wiping prior to each cast. After each line, the CTD was washed down with freshwater. Prior to packing, the cell was flushed with freshwater. **ACTION ITEM: Bring syringe with better fit for flushing the CTD cell.**

Ship's draft is 3m, and this should be taken into account in viewing the data.

Photo of the CTD system, showing the t-tubing and weight mounts

Two major problems were experienced with instruments in this CTD set up:

1) Pump turn on. The SBE9 system contains a hardwired pump control, which is designed to turn the pump on automatically 1minute after the system is immersed in salt water. Despite numerous tests, this function did not appear to work. A workaround was found using an extra serial port connection to the SBE11 from the PC and turning the pump on and off manually for each cast in Seasave. **ACTION ITEM: Investigate automatic pump turn on failure.**

2) Altimeter. The altimeter misfunctioned for all casts of the cruise, with the possible exception of the test cast, which was in very shallow (~ 10m) water. Frequently, reasonable numbers were given during the surface soak, but the readout subsequently remained at this value during the cast. The frequency of the altimeter is 200kHz, which is also one of the frequencies of the ship's echosounder. However, turning off the ship's echosounder at the bridge during the cast did not fix the problem. Note the ship's ADCP is also functioning at 300kHz, and possibly could be another source of interference. Use of extra weight on the CTD (addressing the possible issue of the CTD kiting on lowering) did not solve the issue either. Finally, we abandoned attempts to solve this and just used the ship's echosounder depths and the SBE pressure sensor to decide on final depth for the CTD cast. Our target bottom depth thus became 3m above true bottom. Very occasionally (~ 2-3 casts) there was some indication in the CTD data that the instrument may have hit bottom or encountered something just above the seafloor (e.g., cast 99, which gave profiles consistent with sucking something into the conductivity sensors) however there was no evidence of damage to the system.

The CTD casts number 219 in total, including 7 test casts taken (some in water, some on deck) taken prior to arrival in the strait region (see map and table above).

Preliminary data processing was done on board by Cecilia Peralta-Ferriz, using the Seabird data processing software as described below.

CTD PROCESSING NOTES

```
% BERING STRAIT 2014 -- CTD DATA
% NOTES ON POST-PROCESSING OF SBE 911 DATA: STEP BY STEP
% July 14, 2014
% Peralta-Ferriz, Cecilia (ferriz@apl.washington.edu)


% OPEN SBE Data Processing software

% a) DATA CONVERSION:
%    *In FILE SETUP
%    -- CHECK box on match instrument to configuration file
%    -- Choose input file (should be .HEX) and directory
%    -- Choose output directory
%    *In DATA SETUP
%    -- Convert data from: Downcast (since we did not take bottle samples this year)
%    -- Create file types: data (.CNV) only
%    -- Select output variables... for 2014 data I chose
%    --              1) Pressure, Digiquartz (db)
%    --              2) Temperature (ITS-90, degC)
%    --              3) Temperature,2 (ITS-90, degC)
%    --              3) Conductivity (S/m)
%    --              4) Conductivity, 2 (S/m)
%    --              6) Oxygen raw, SBE 43 (Volts)
%    --              7) Oxygen, SBE 43 (% saturation)
%    --              8) Fluorescence WET Labs WET star (mg/m^3)
%    --              9) Upoly 0, FLNTURT
%    -- Source for start time in output .cnv header:  Select NMEA time

% b) FILTER:
%    *In DATA SETUP
%    -- Lowpass filter A(sec): 0.5 (gave better results than no filter)
%    -- Lowpass filter B(sec): 0.15
%      --> SPECIFY FILTERS
%    --      Temperature: Lowpass filter A
%    --      Temperature,2: Lowpass filter A
%    --      Conductivity: Lowpass filter A
%    --      Conductivity,2: Lowpass filter A
%    --      Pressure: Lowpass filter B
%    --      Oxygen raw: Lowpass filter A
%    --      Oxygen %: Lowpass filter A
%    --      All others: None
%    *In FILE SETUP
%    -- I suggest add append = F05and15    ...% this indicates data was filtered

% c) ALIGN:
%    *In DATA SETUP
%      --> Enter Advance values
%    -- Oxygen: 5 (as recommended in SBE9+ manual ( 2 to 5))
%    -- All others: 0
%    *In FILE SETUP
%    -- Append added = A
```

```
% d) CELL THERMAL MASS:
%    *In DATA SETUP (correct both Primary and Secondary values)
%     -- Thermal anomaly amplitude [alpha]: 0.03 (suggested for SBE9+)
%     -- Thermal anomaly time constant [1/beta]: 7 (suggested for SBE9+)
%    *In FILE SETUP
%    -- Append added = CTM

% e) LOOP EDIT:
%    *In DATA SETUP
%     -- Minimum ctd velocity (m/s) =  0.25
%       --> Check box Remove Surface soak = 5 m
%     -- Surface soak depth (m) = 2
%     -- Minimum soak depth (m) = 4
%     -- Maximum soak depth (m) = 6
%       --> Check box Use deck pressure as pressure offset
%       --> Check box Exclude scans marked bad
%    *In FILE SETUP
%    -- Append added = L

% f) DERIVE:
%    *In DATA SETUP
%       --> Select derived variables... add:
%     -- Salinity (psu)
%     -- Salinity,2 (psu)
%     -- Density (kg/m3)
%     -- Density,2 (kg/m3)
%     -- Oxygen, SBE 43 (ml/l)
%     -- Oxygen, SBE 43 (%saturation)
%     -- Potential Temperature (ITS-90, degC)
%     -- Potential Temperature,2 (ITS-90), degC)
%     -- Density (sigma-theta)
%     -- Density,2 (sigma-theta)
%    *In FILE SETUP
%    -- Append added = D

% g) BIN AVERAGE:
%    *In DATA SETUP
%     -- Bin type = Pressure
%     -- Bin size = 1
%       --> Select Exclude scans marked bad
%     -- Scans to skip over = 0
%     -- Cast to process = Downcast
%    *In FILE SETUP
%    -- Append added = B

% h) ASCIIout:
%    *In FILE SETUP
%    --> Select Output header file
%    --> Select Output data file
%    --> Select Exclude scans marked bad
%    -- Column separator= Space
%      --> SELECT OUTPUT VARIABLES
%     -- Pressure (db)
%     -- Temperature (ITS-90, degC)
```

% -- Temperature, 2 (ITS-90, degC)
% -- Conductivity (S/m)
% -- Conductivity, 2 (S/m)
% -- Oxygen raw, SBE 43 (V)
% -- Oxygen, SBE 43 (% saturation)
% -- Fluorescence, WET Labs ECO-AFL/FL (mg/m3)
% -- Turbidity, FLNTURT (NTU)
% -- Salinity (psu)
% -- Salinity,2 (psu)
% -- Density (kg/m3)
% -- Density,2 (kg/m3)
% -- Potential Temperature (ITS-90, degC)
% -- Potential Temperature,2 (ITS-90), degC)
% -- Density (sigma-theta)
% -- Density,2 (sigma-theta)

% SO, FINAL PROCESSED NAMES (total of 2 per original file) WILL BE:
% - BStrait14xxxCF05and15ACTMLDB.asc
% - BStrait14xxxCF05and15ACTMLDB.hdr
% where xxx = No. of cast (e.g., 001, 002, ..., 025, 026, 027, ..., 211, 212, etc)

BERING STRAIT 2014 CTD LINES

A total of 13 CTD lines were run on the cruise, far more than planned in this short cruise. We were able to accomplish so many stations due to the efficiency and speed of ship and deck operations during the CTD work, and due to the great assistance from and preparedness of the ship's crew, which allowed us to start CTD operations immediately after mooring work.

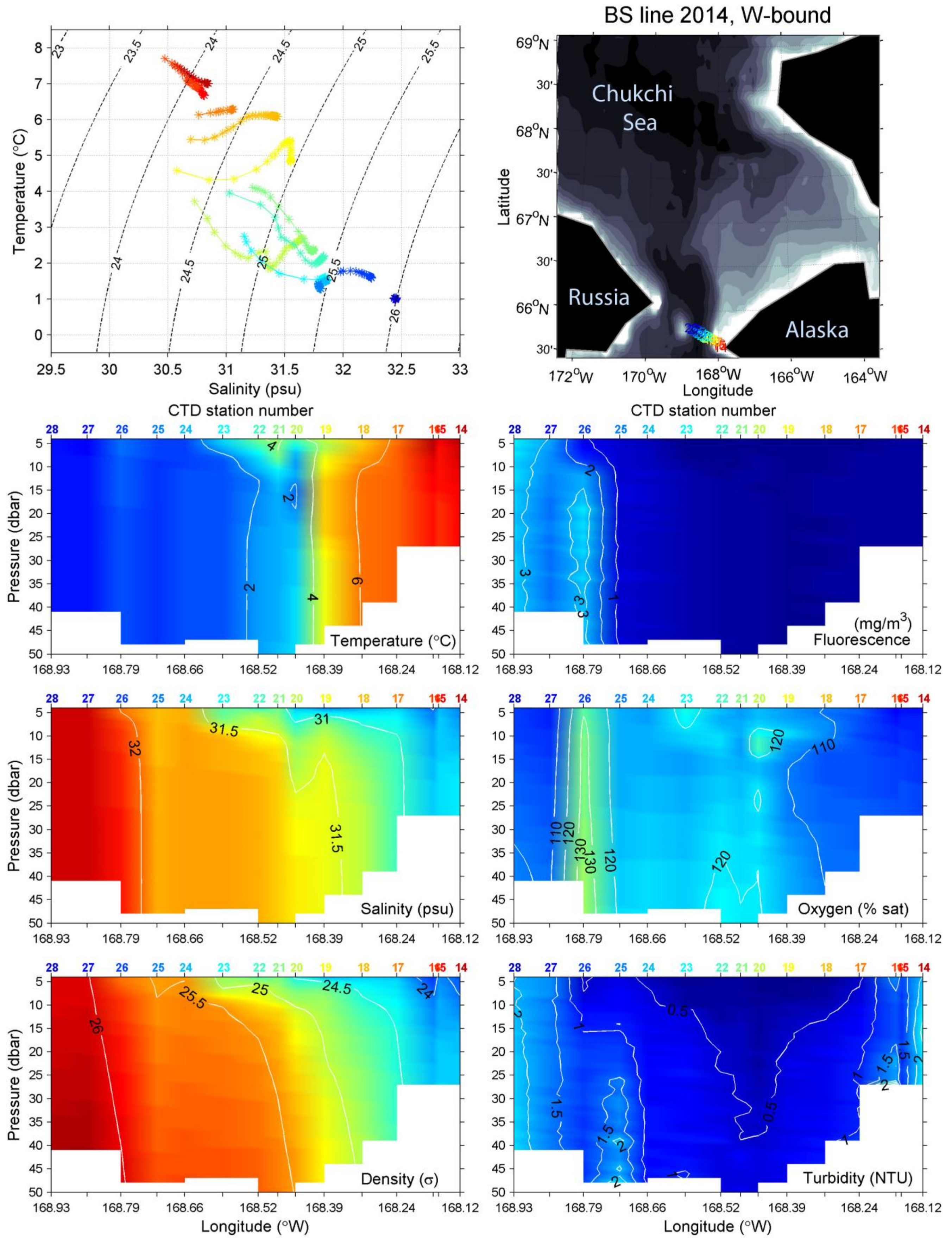
Preliminary sections were plotted by C Peralta-Ferriz from the corrected data. The plots below give all 13 sections on the same scales, presented in order of data acquisition, and then the DL lines again with a different set of scales.

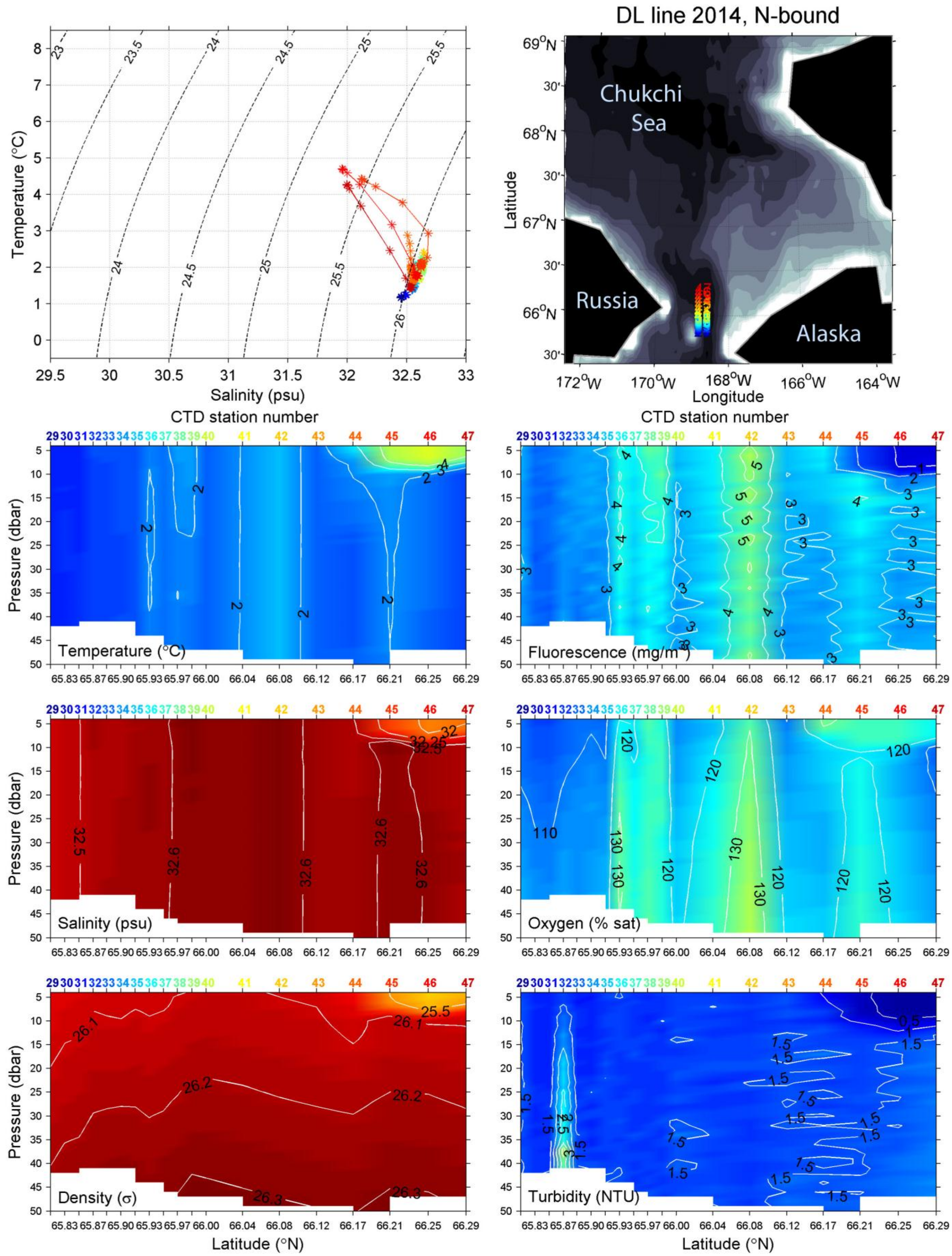
Various repeat stations were run during the cruise, after intervals of hours and of days. It is of particular interest that the Bering Strait line was run under northward wind conditions at the start of the cruise and under weak southward wind conditions at the conclusion of the cruise. In this second case, however the flow was still strongly northward. Remarkable on the strait sections is a trapped eddy near the Diomede islands, which is present in both crossings. Note the second crossing of the strait was done with half the station spacing of the original run.

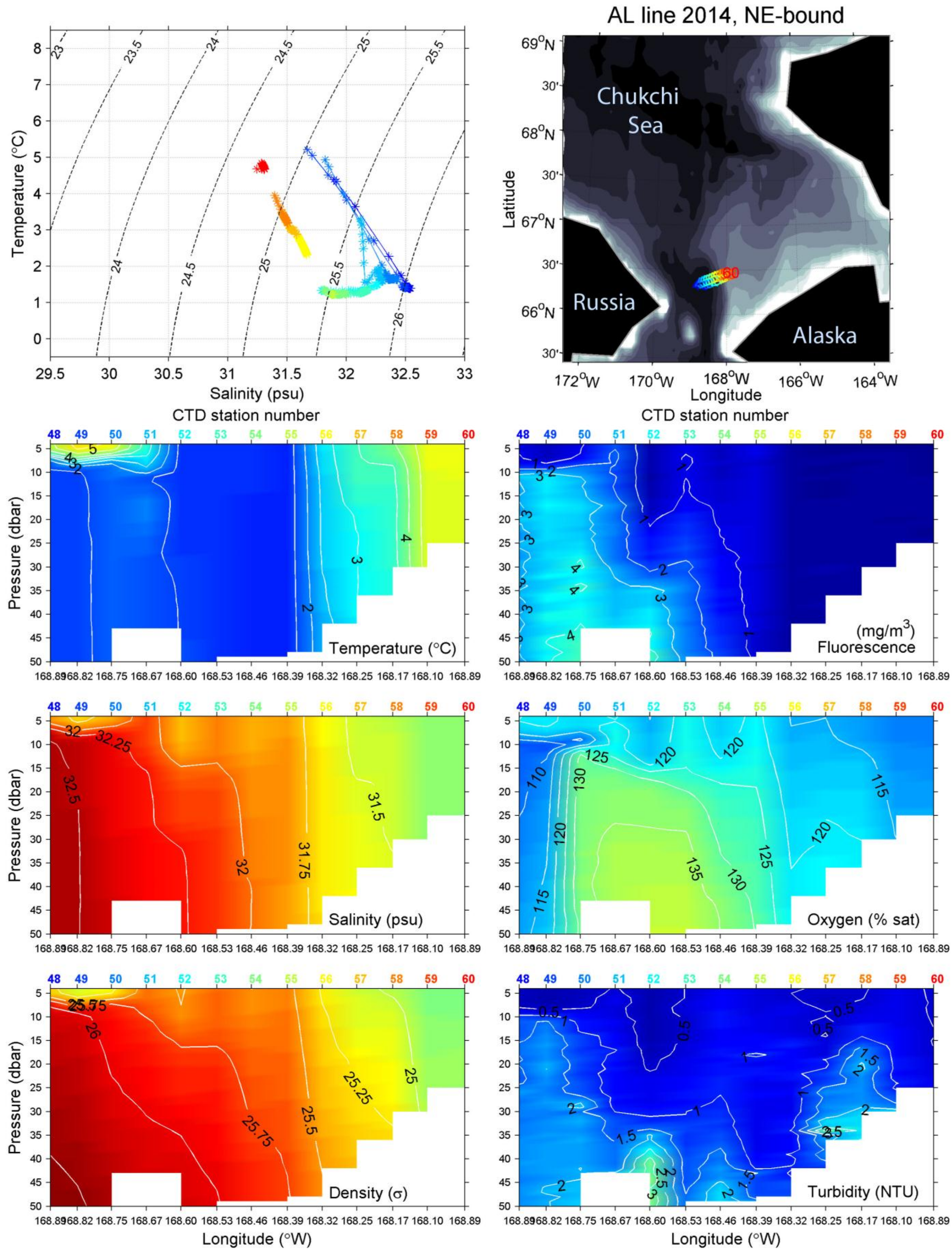
Overall, it is interesting to note the change in stratification, being mostly temperature dominated in the north, to being determined by both temperature and salinity change in the south. It appears that at the time of this cruise, the fresh Alaskan Coastal waters were less extensive than in previous years, possibly due to the earliness of the season, or due to mixing. **ACTION ITEM: Investigate.**

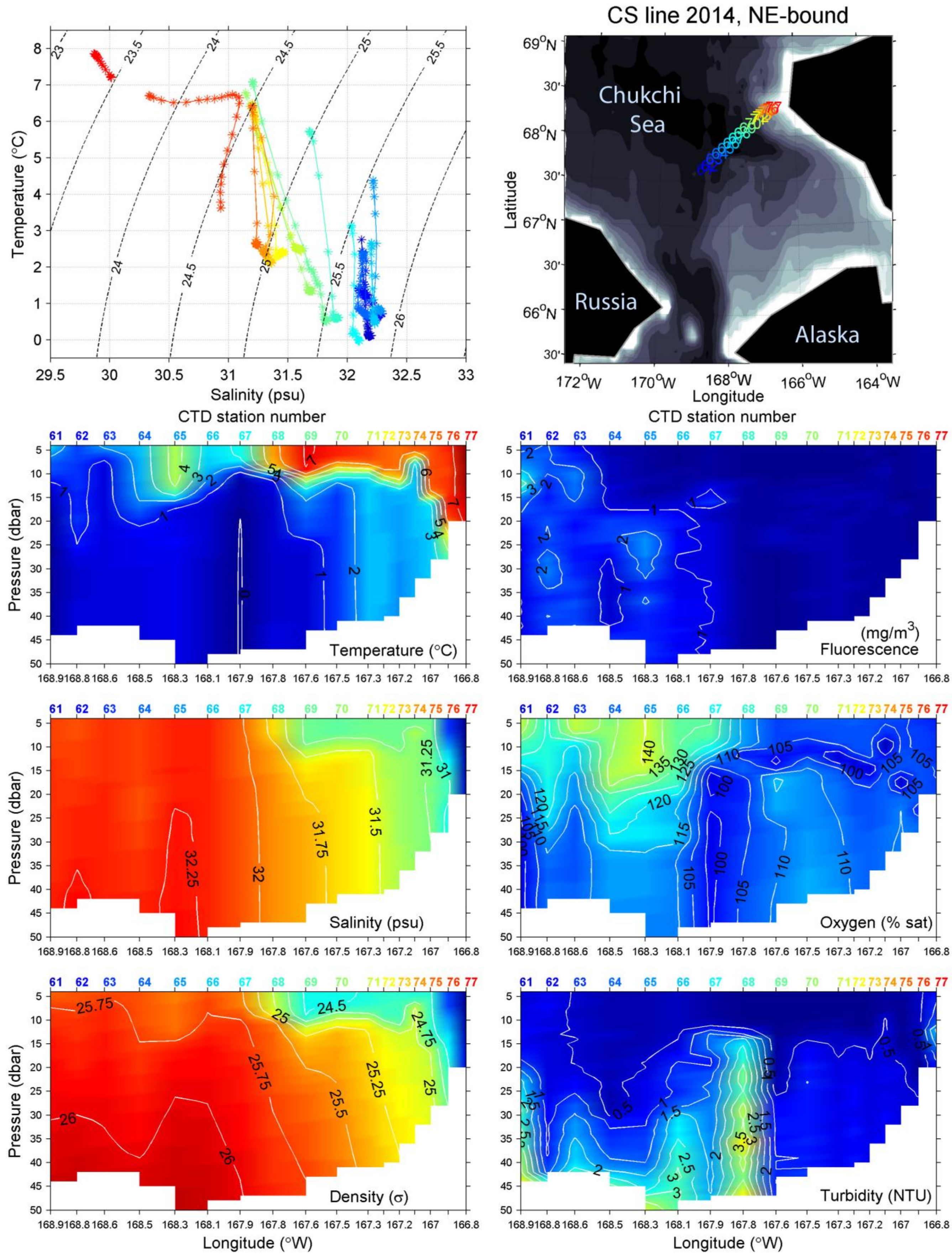
Also noteworthy in these data are the relationships between fluorescence, oxygen and turbidity, with suggestions of different ages of blooms, and possible fall out of blooms to the benthos. **ACTION ITEM: Investigate.**Oxygen values are calculated by Seabird software and are reported here in % saturation, with highest values being over 170%. Note we have no bottle samples with which to verify these data. **ACTION ITEM: Investigate.**

Remarkable spatial variability in water properties was found on the repeat DL lines just north of the Diomede Islands. It will be informative to consider these data in light of prior data and the underway temperature, salinity and ADCP data recorded during the cruise. Note also that several of the casts ion this line shows almost homogeneous water columns, suggestive of very strong vertical mixing. **ACTION ITEM: Investigate.**

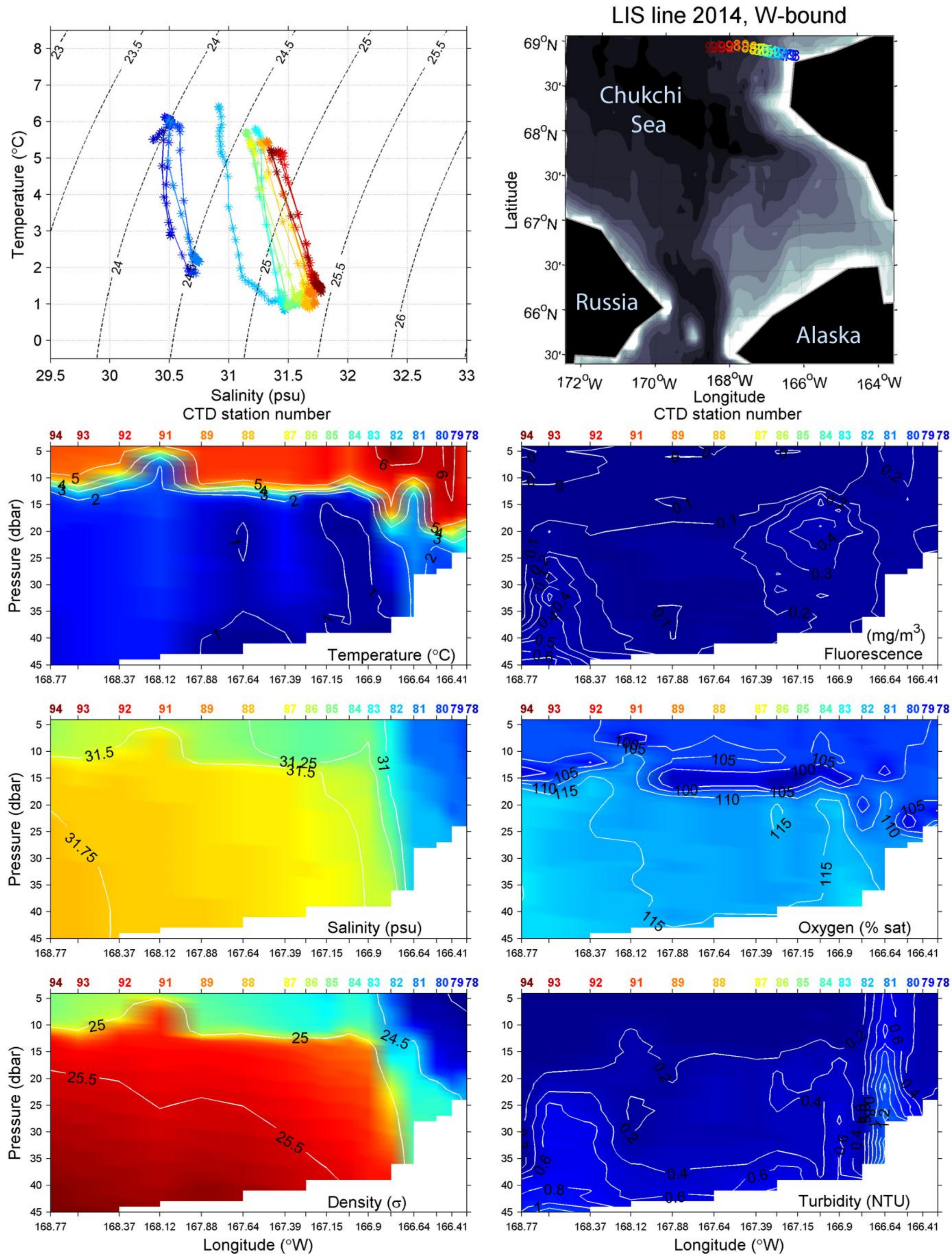

BS line 2014, W-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
(mg/m3) Fluorescence
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Longitude (°W)

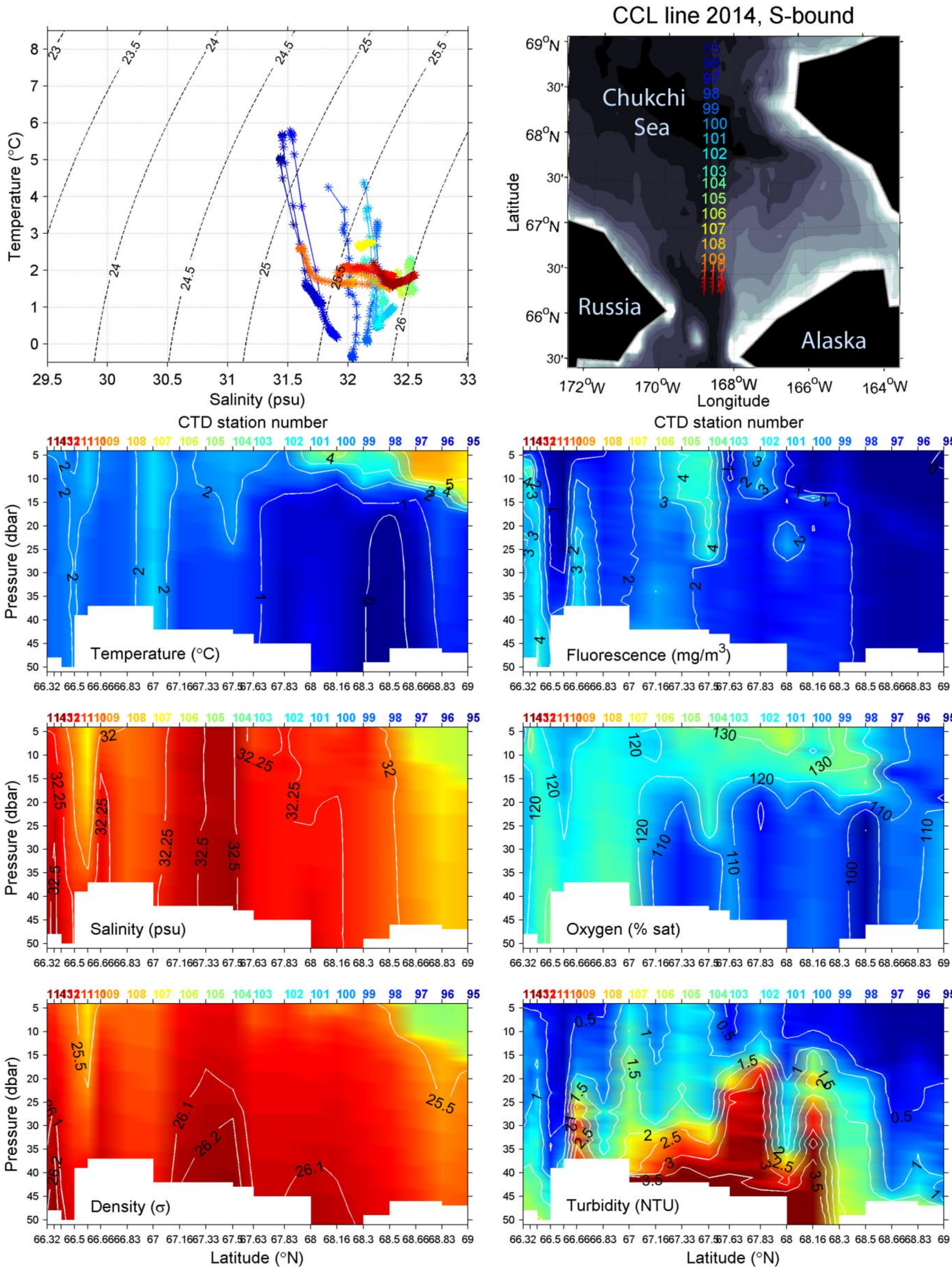

Temperature (°C)
Salinity (psu)
DL line 2014, N-bound
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
Fluorescence (mg/m³)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Latitude (°N)

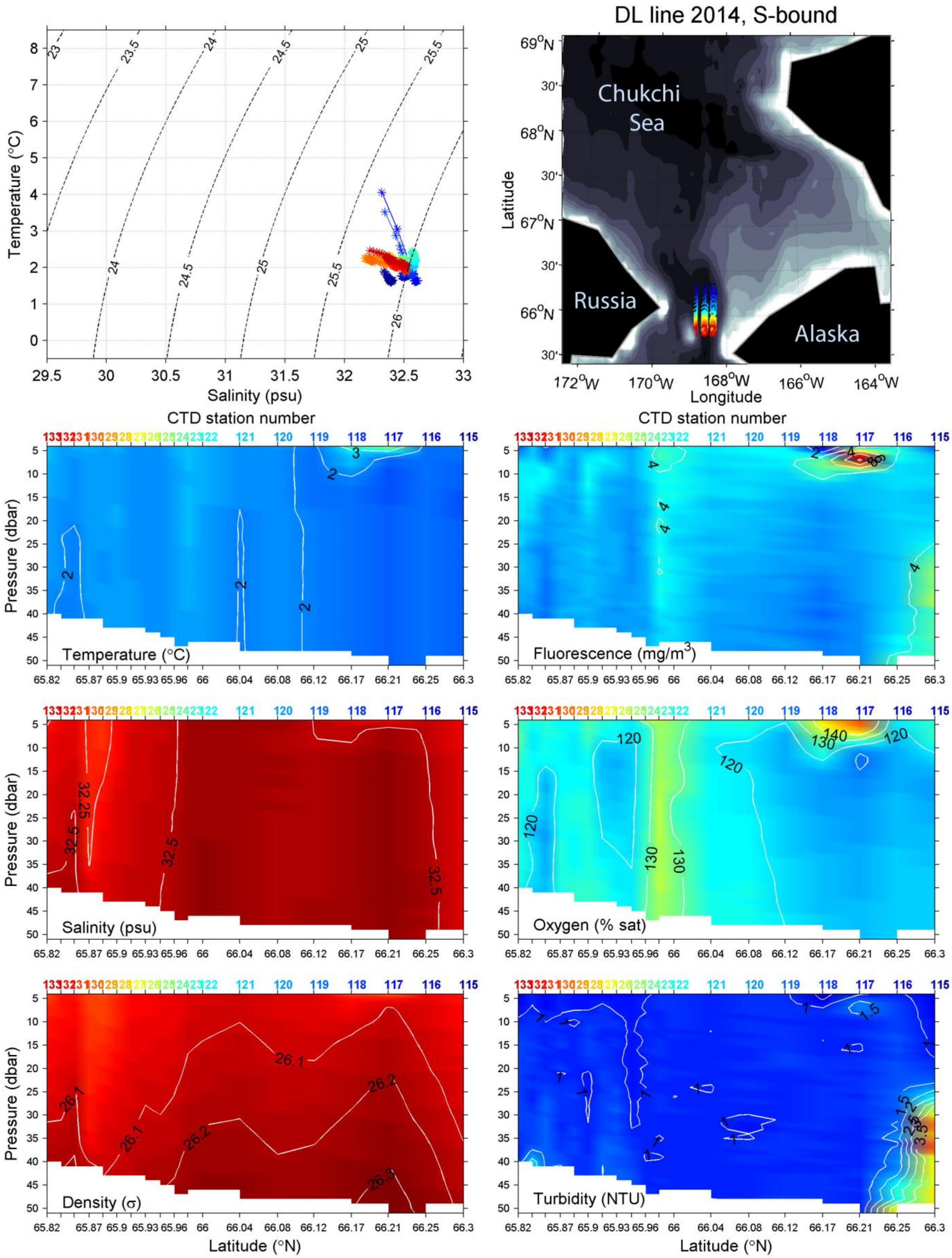

AL line 2014, NE-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
(mg/m3) Fluorescence
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Longitude (°W)

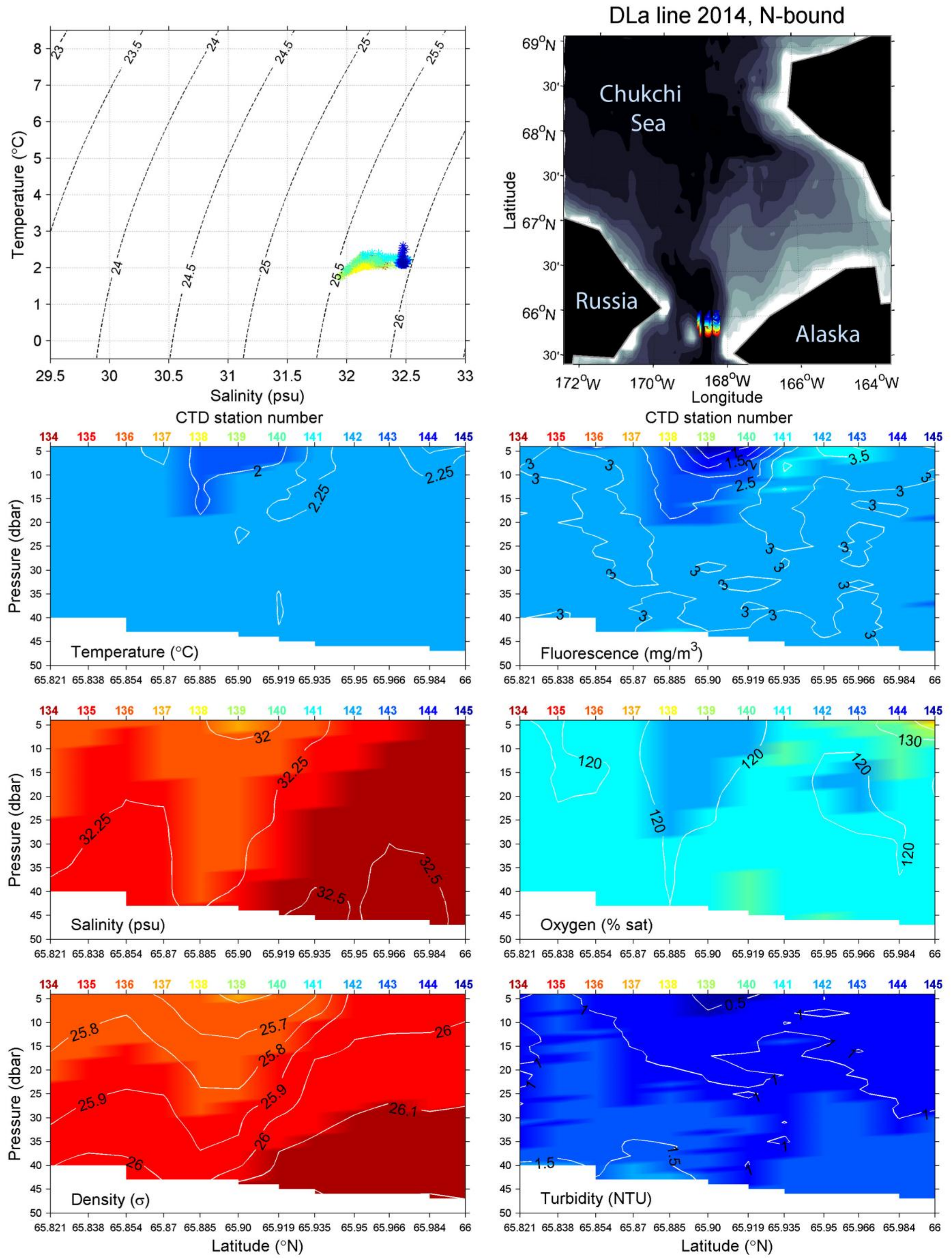


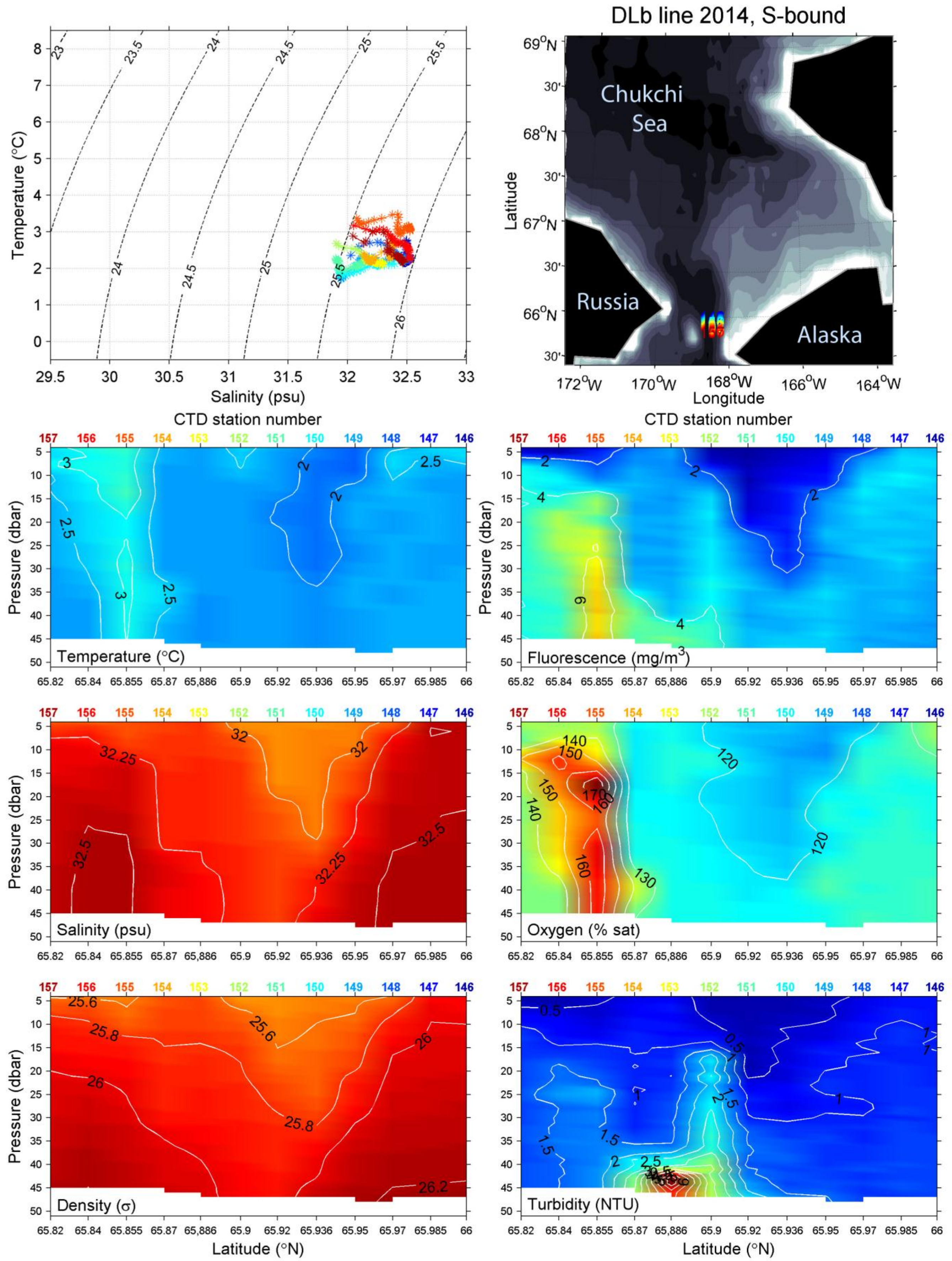
CS line 2014, NE-bound
Chukchi Sea
Russia
Alaska
Latitude
Longitude
69°N
68°N
67°N
66°N
172°W
170°W
168°W
166°W
164°W
Temperature (°C)
Salinity (psu)
CTD station number
Pressure (dbar)
Temperature (°C)
(mg/m³)
Fluorescence
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Longitude (°W)
61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77


LIS line 2014, W-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
(mg/m³)
Fluorescence
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Longitude (°W)

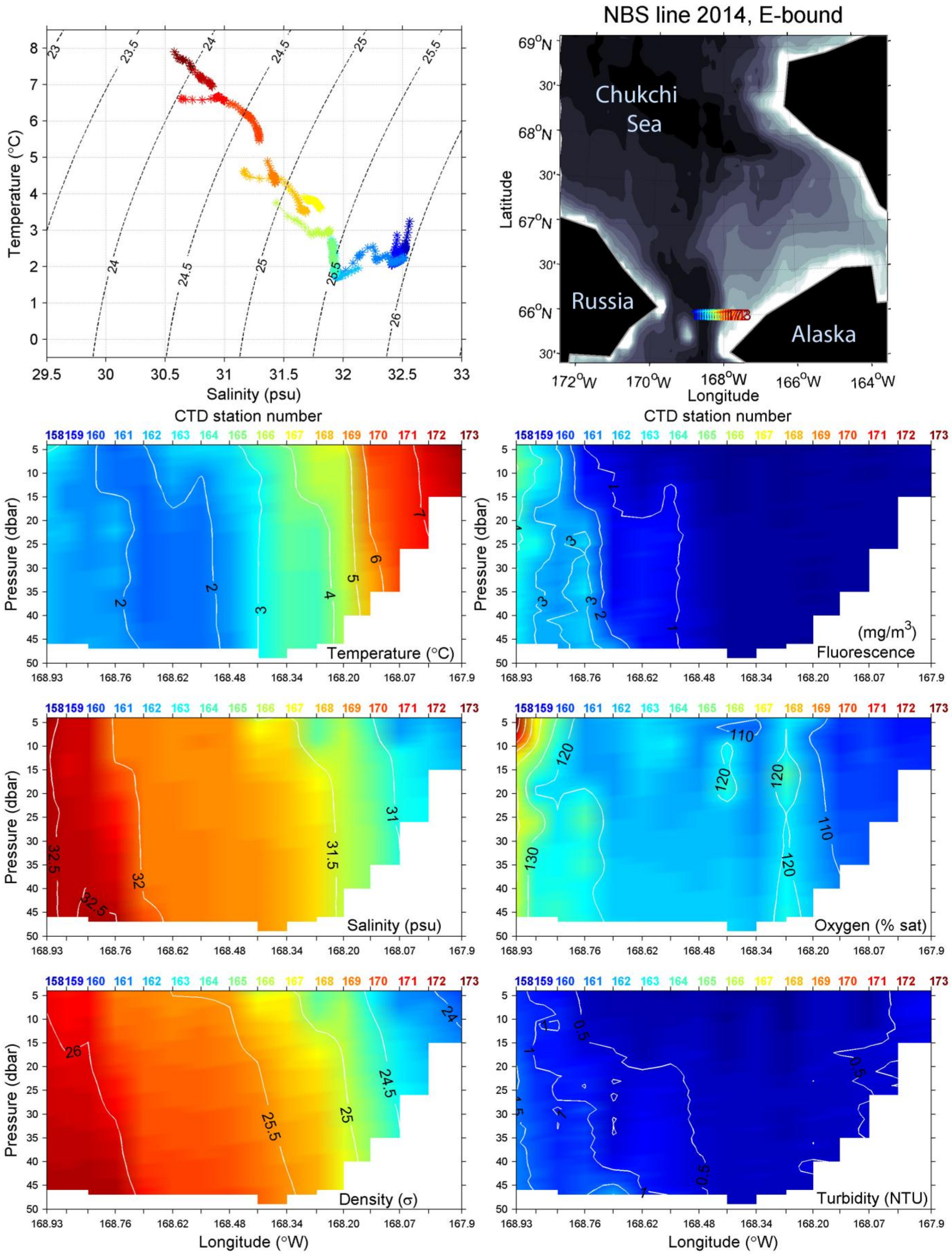

CCL line 2014, S-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
Fluorescence (mg/m^3)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Latitude (°N)

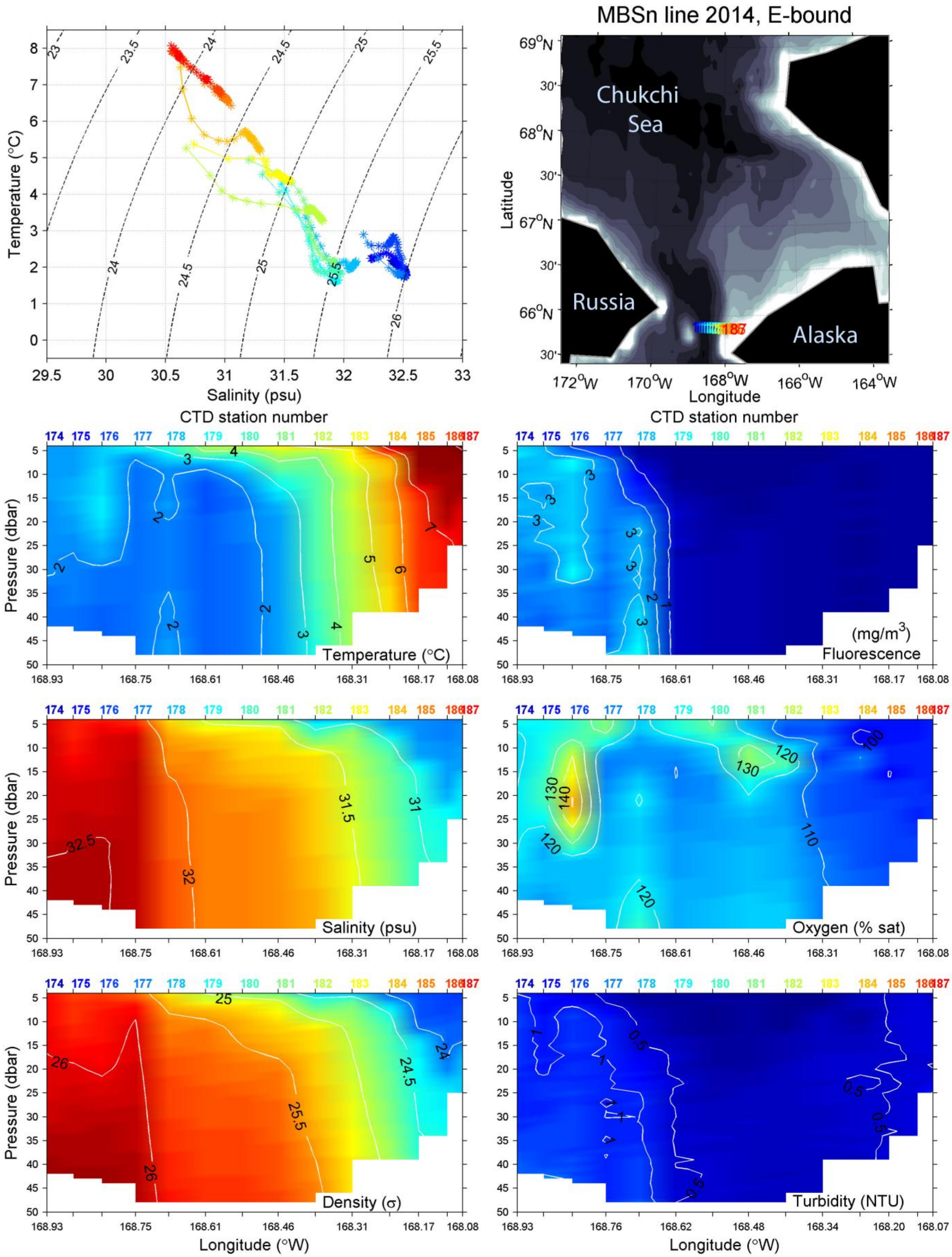

DL line 2014, S-bound
Chukchi Sea
Russia
Alaska
Temperature (°C)
Salinity (psu)
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
Fluorescence (mg/m^3)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Latitude (°N)

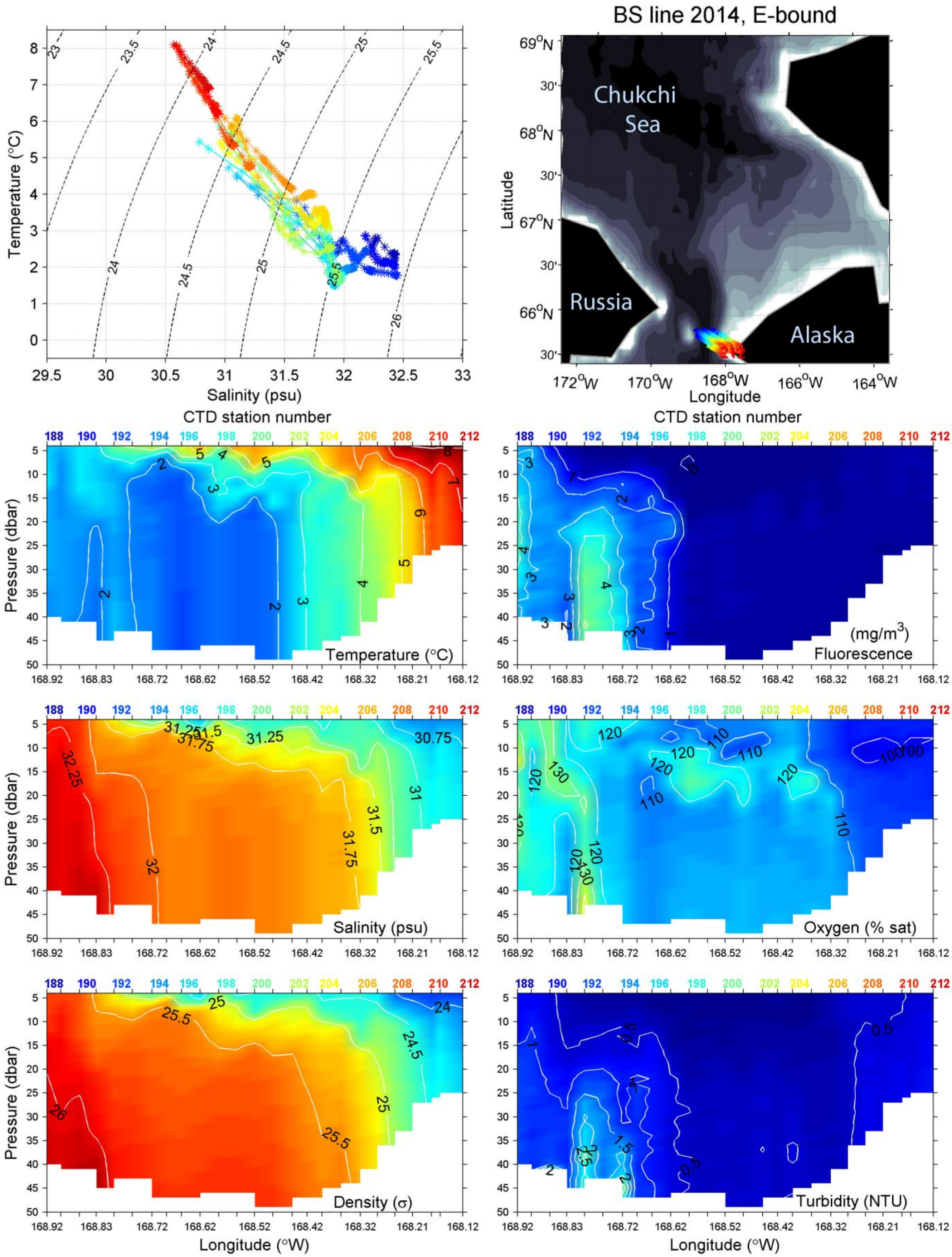

DLa line 2014, N-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
69°N
68°N
67°N
66°N
172°W
170°W
168°W
166°W
164°W
CTD station number
134 135 136 137 138 139 140 141 142 143 144 145
Pressure (dbar)
Temperature (°C)
Fluorescence (mg/m3)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
65.821 65.838 65.854 65.87 65.885 65.90 65.919 65.935 65.95 65.966 65.984 66
Latitude (°N)

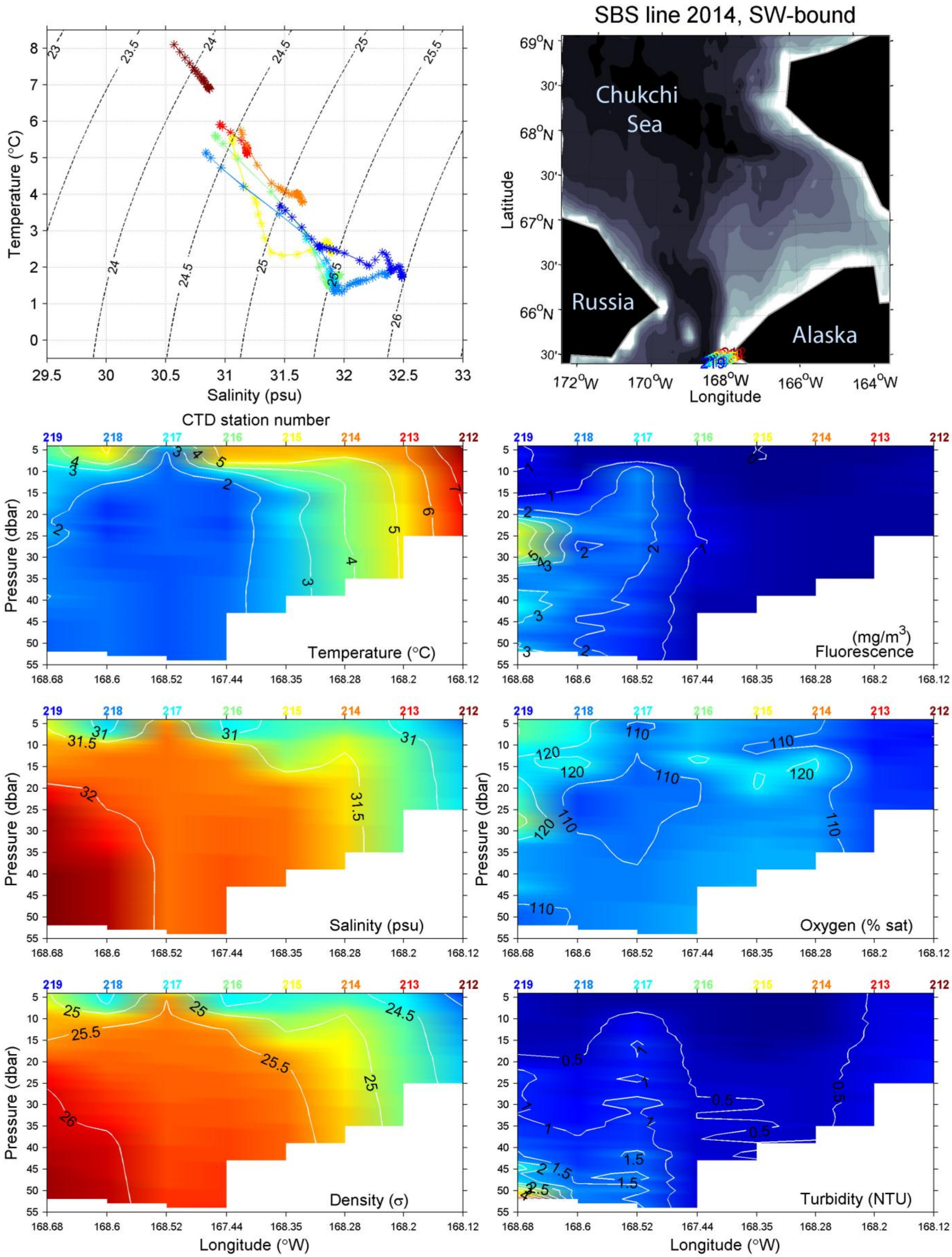


DLb line 2014, S-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
Fluorescence (mg/m3)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Latitude (°N)

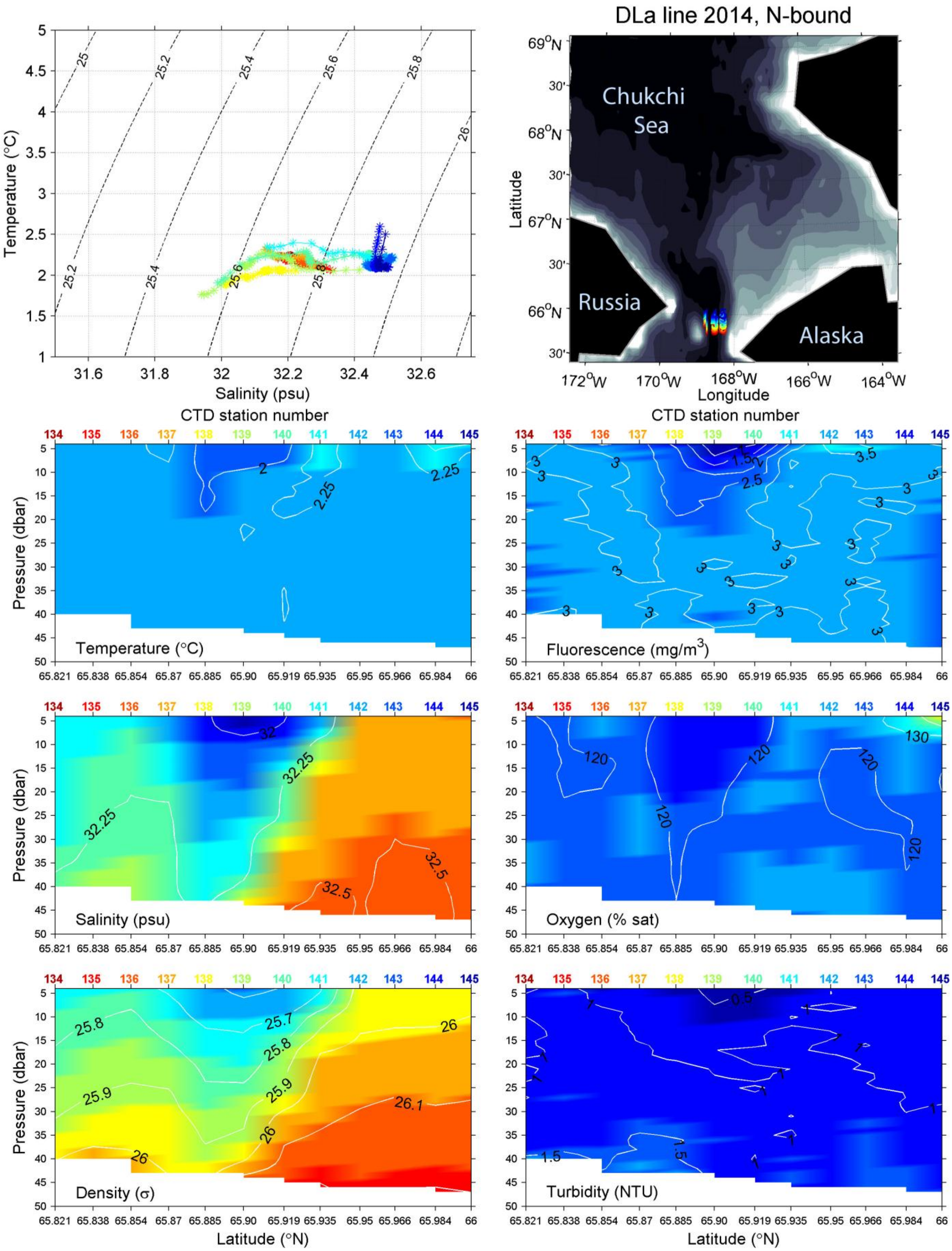

NBS line 2014, E-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173
Pressure (dbar)
Temperature (°C)
Fluorescence
(mg/m^3)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Longitude (°W)


MBSn line 2014, E-bound
Chukchi Sea
Russia
Alaska
Latitude
Longitude
Temperature (°C)
Salinity (psu)
CTD station number
Pressure (dbar)
Fluorescence
(mg/m3)
Density (σ)
Oxygen (% sat)
Turbidity (NTU)
Longitude (°W)

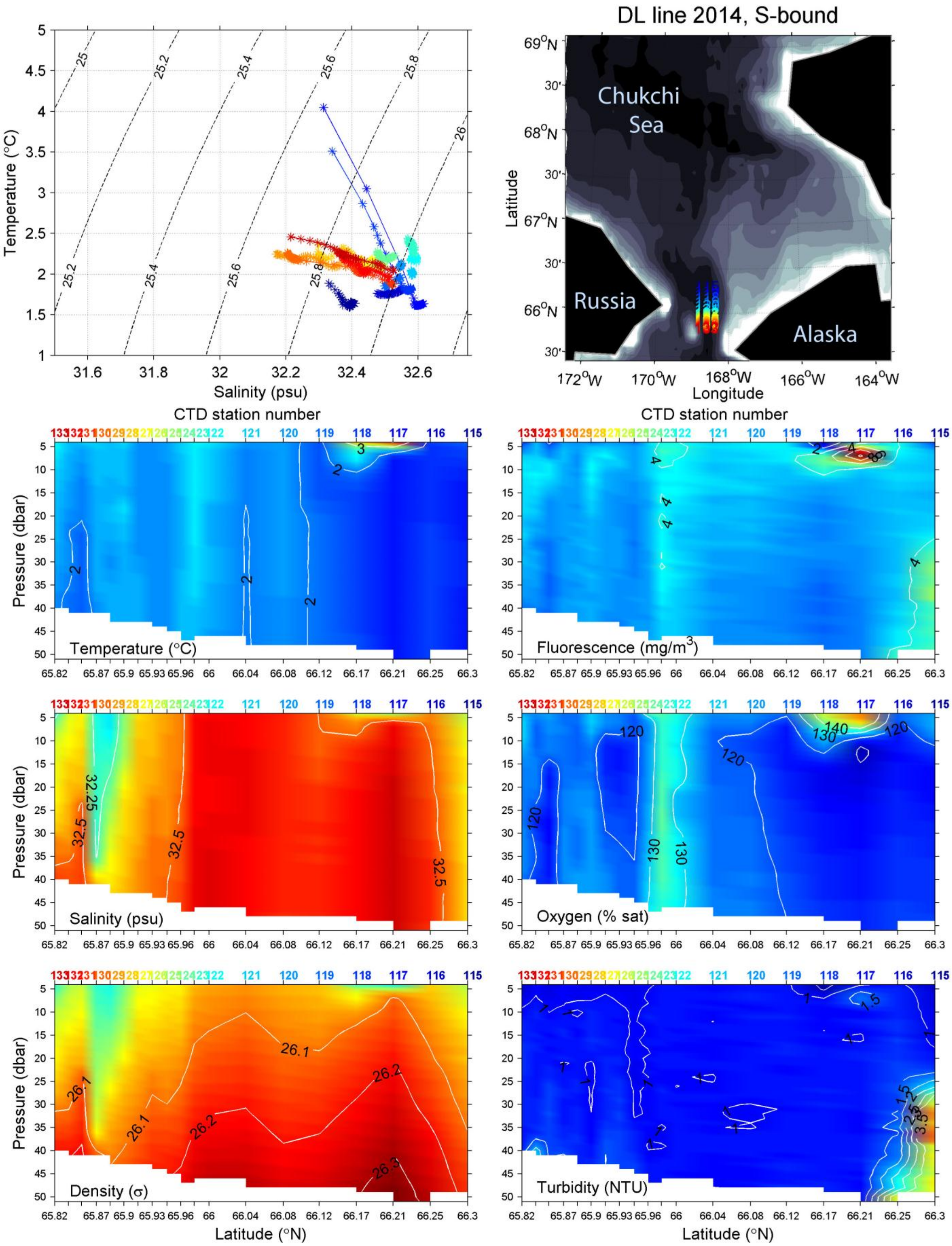

BS line 2014, E-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
(mg/m^3)
Fluorescence
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Longitude (°W)

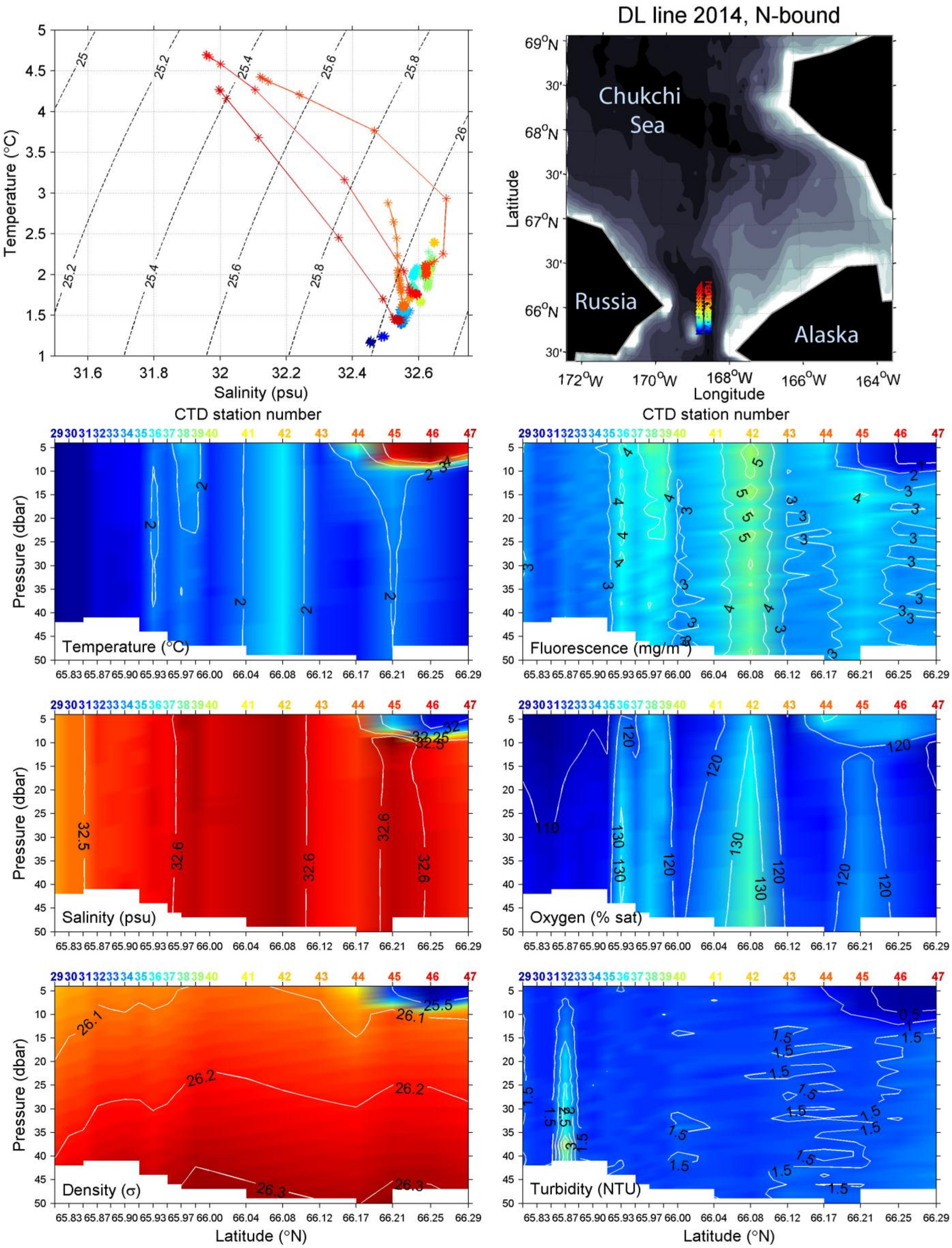


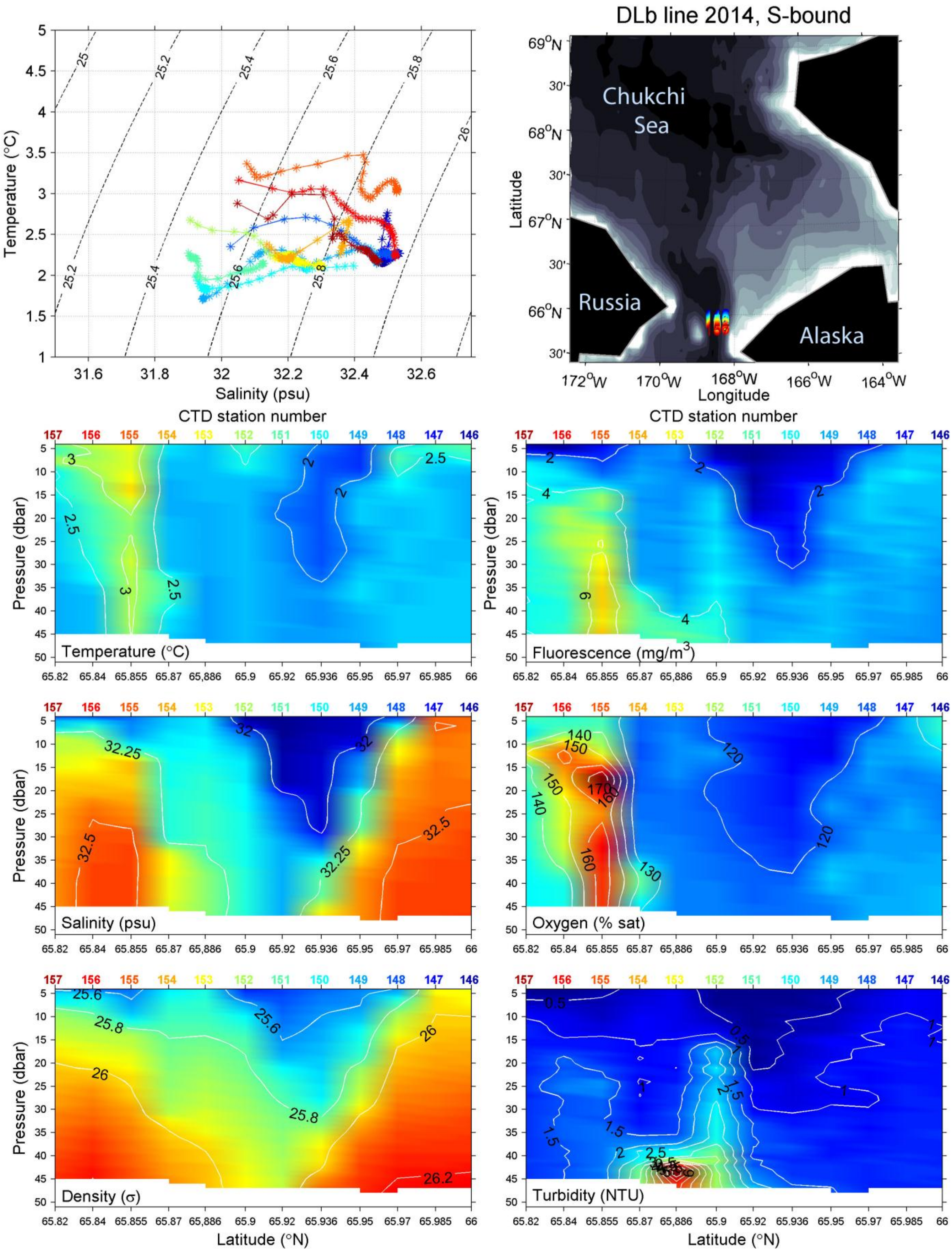
SBS line 2014, SW-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
219 218 217 216 215 214 213 212
Pressure (dbar)
Temperature (°C)
(mg/m3) Fluorescence
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Longitude (°W)



DLa line 2014, N-bound
Temperature (°C)
Salinity (psu)
Chukchi Sea
Russia
Alaska
Latitude
Longitude
CTD station number
Pressure (dbar)
Temperature (°C)
Fluorescence (mg/m^3)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Latitude (°N)


DL line 2014, S-bound
Chukchi Sea
Russia
Alaska
Temperature (°C)
Salinity (psu)
Latitude
Longitude
CTD station number
Pressure (dbar)
Fluorescence (mg/m3)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Latitude (°N)


DL line 2014, N-bound
Chukchi Sea
Russia
Alaska
Latitude
Longitude
Temperature (°C)
Salinity (psu)
CTD station number
Pressure (dbar)
Temperature (°C)
Fluorescence (mg/m³)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Latitude (°N)


DLb line 2014, S-bound
Chukchi Sea
Russia
Alaska
Latitude
Longitude
Temperature (°C)
Salinity (psu)
CTD station number
Pressure (dbar)
Temperature (°C)
Fluorescence (mg/m3)
Salinity (psu)
Oxygen (% sat)
Density (σ)
Turbidity (NTU)
Latitude (°N)

BERING STRAIT 2014 UNDERWAY DATA REPORT – Woodgate (UW)

Underway CTD, ADCP and some meteorological data were collected during the cruise using the Norseman II's ship-based systems.

ADCP: This year, as last year, we collected data from the Norseman II's Teledyne RD Instruments 300kHz Workhorse Mariner ADCP (SN 19355), which is equipped with high accuracy bottom tracking. The ADCP is mounted 3m below the water line. This system was operational for the cruise, running with 4m bins. The following file types are available for processing (file information copied from http://po.msrc.sunysb.edu/SBI/Healy_ADCPs.htm)

- *.ENR – raw binary ADCP data which contains every ping
- *.ENS – Binary ADCP data after the data has been preliminarily screened for backscatter and correlation
- *.ENX - Binary ADCP data after screening and rotation to earth coordinates
- *.STA - Binary ADCP ensemble data that has been averaged into short term averages
- *.LTA - Binary ADCP ensemble data that has been averaged into long term averages
- *.N1R - Raw NMEA ASCII data from the primary navigation source
- *.N2R - Raw NMEA ASCII data from the secondary navigation source, if available, and which should include Ashtech heading data
- *.NMS - Binary screened and averaged navigation data
- *.VMO - This ASCII file is a copy of the *.ini options file that was used during the data collection
- *.LOG - ASCII file containing a log of any errors the ADCP detected during the session

Preliminary data plots will be added to this report once available.**Action item: Process ADCP data.**

MET DATA: Meteorological data (including wind speed and direction, air temperature, humidity and pressure) were recorded every 15seconds with position, and course, during the cruise. **ACTION ITEM: Check position used for met sensors.** A preliminary plot of these data is given below. No data quality control has yet been applied to these data. Note the high wind speeds (10-20knots) for most of the cruise, with the wind turning from northward to southward on JD 186 (5th July 2014). **ACTION ITEM: Check wind direction is corrected for magnetic declination.** Relative humidity is high, consistent with the dominantly foggy conditions. While air temperature values are broadly consistent with a human assessment of the temperature, there are many curious peaks in the record, with changes often coincident with changes in the ship's course. **ACTION ITEM: Check air temperature record to ensure it is not being contaminated with warm air from the ship.**

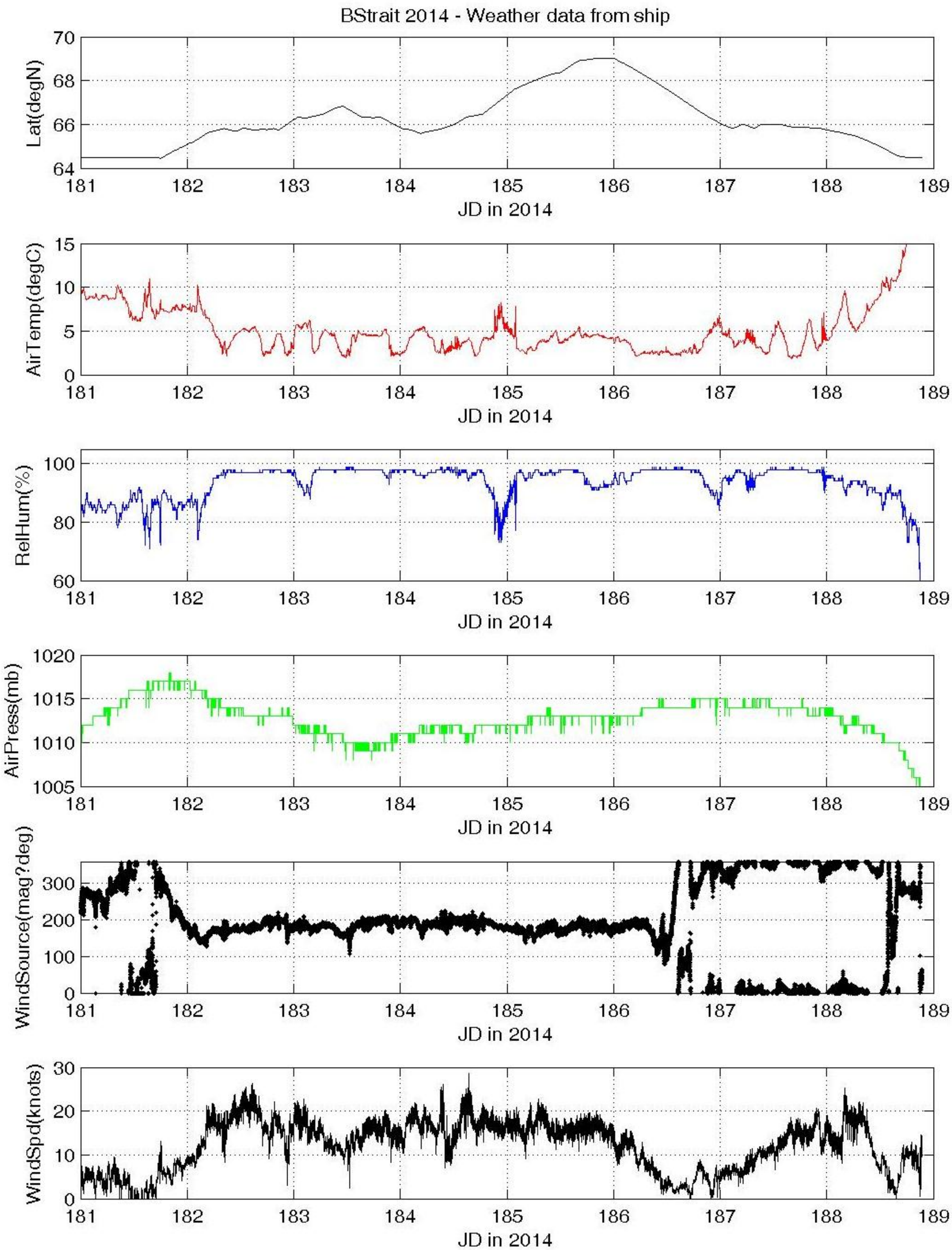
UNDERWAY TEMPERATURE AND CONDUCTIVITY DATA: The Norseman II used an Seabird SBE21 temperature conductivity sensor mounted 3.4m below the water line (slightly to port of the ship's ADCP, in the center of the ship) to collect underway data every 10s throughout the cruise, also logging position information.

Between the end of the NBS line and the end of the MBS line, the SBE21 was not collecting data. The cause of this is assumed to have been a voltage spike from the winch, which tripped the power supply to the SBE21. The SBE21 is on a UPS (Uninterrupted Power Supply), which presumably ran on battery power for some time before failing**. ACTION ITEM: Investigate a monitoring system of this system, for example making it an hourly part of the CTD driver's duties.**

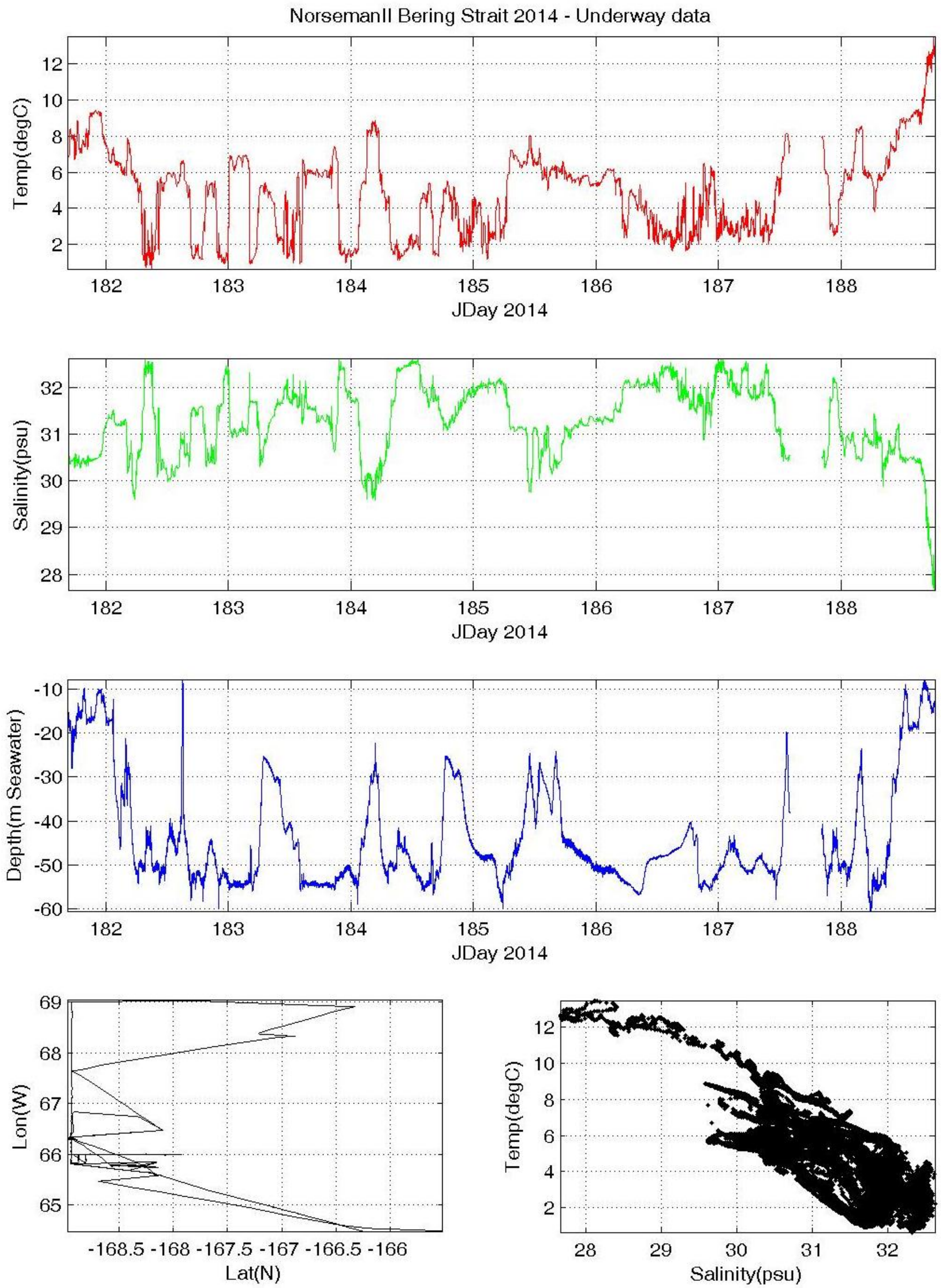
Preliminary plots of the underway temperature and salinity data are given below. Salinity data are obtained from SBEData processing (values 1e-3psu fresher than the usual data conversion).

The typical pattern of waters being warmer and fresher near the Alaskan coast is evident in these data. However, in stark comparison to last year (which recorded salinities of 20psu), the lowest underway salinities recorded were ~ 30psu (in the strait, and off Point Hope). Note that warmer waters are also found in the north of the study area, as per last year. It is very important to remember when interpreting these data, that they are not synoptic, as is evidenced by the plots of the various crossings of the Bering Strait also shown below.

BERING STRAIT 2014 METEOROLOGICAL DATA



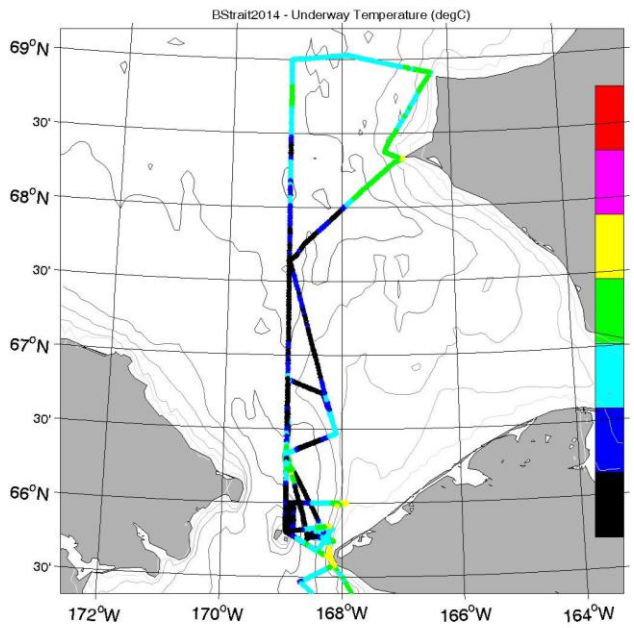
BERING STRAIT 2014 UNDERWAY TEMPERATURE SALINITY DATA



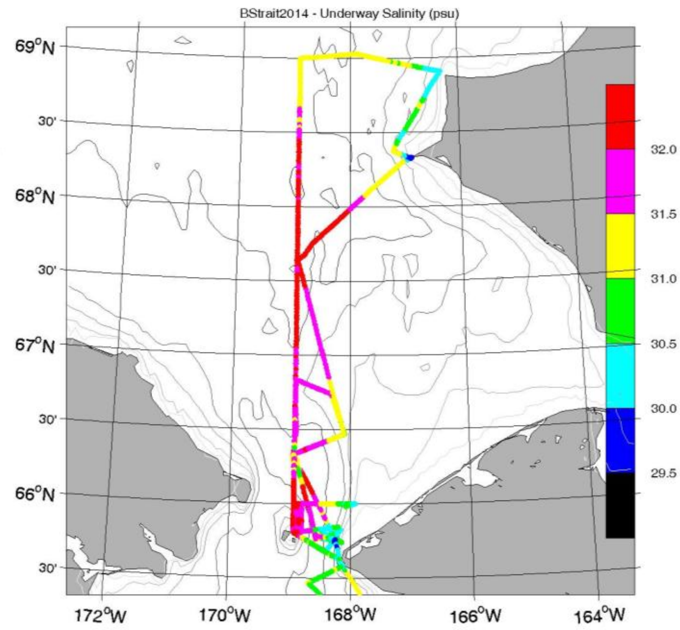
BERING STRAIT 2014 UNDERWAY TEMPERATURE SALINITY DATA (continued)

Whole cruise

Temperature (degC)

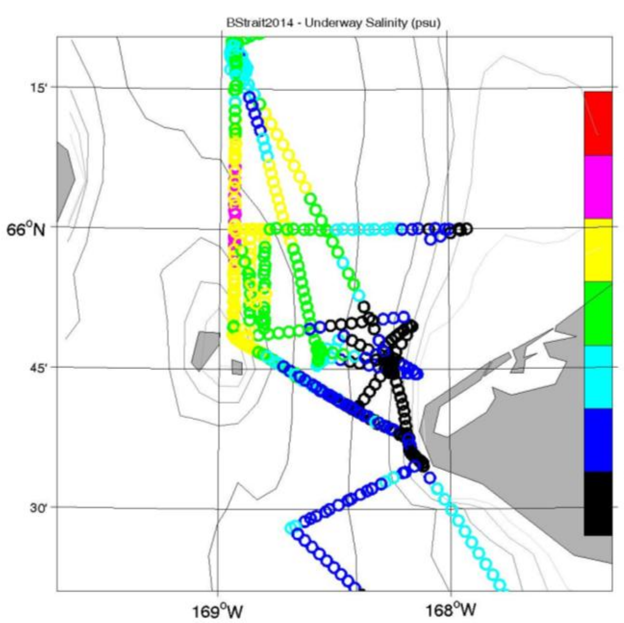


Salinity (psu)

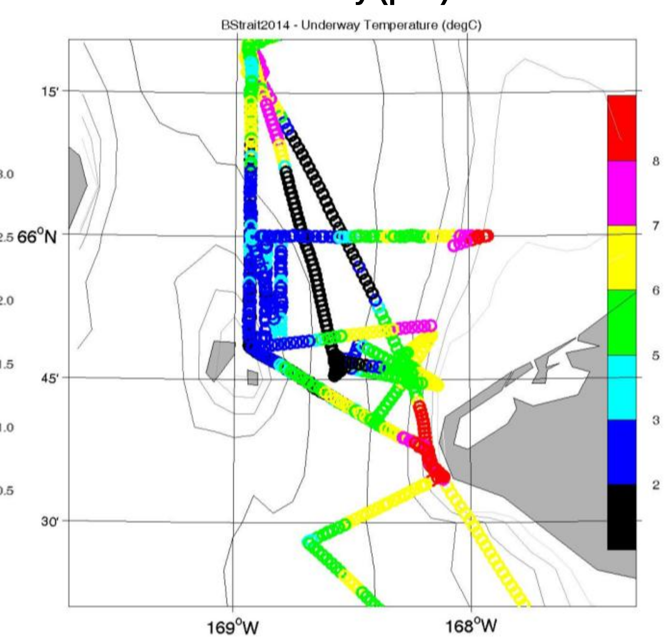


Detail of the Bering Strait region (for the entire cruise) (Note the warming in the strait region during the cruise – compare black temperature tracks during mooring operations with the warmer NBS and post MBSn crossings.

Temperature (degC)



Salinity (psu)



BERING STRAIT 2014 TARGET CTD POSITIONS

The following lists give the positions of the CTD lines taken in US waters in the Bering Strait region in the last decade as part of the Bering Strait mooring cruises. Stations taken on this 2014 cruise are included in the full event log later in this cruise report.

```
%==========================================================
% Stations for BStrait Mooring Cruise 2014 Norseman II
%==========================================================
%
% US-Russian convention line is at 168deg 58.7'W.
% All stations in this file are in US waters.
% (Let me know if any points are too close to border for you.)
%
% Time estimates are based on the 2013 Norseman II cruise.
%==========================================================
%
%==========================================================
% *****   MOORING POSITIONS *****
%==========================================================
% In likely order of servicing, i.e.,
% - recoveries from east to west in strait, then northern site;
% - deployments northernsite, the west to east in strait.
% == 3 moorings to recover
% == 3 moorings to deploy
%-------------------------------------------
% RECOVERIES of moorings deployed in 2013
%-------------------------------------------
%NAME        Lat(N)          Long (W)      Water   Top
%            deg min         deg min       depth   Float
% A4-13      65  44.75       168  15.75     49m    17m
% A2-13      65  46.86       168  34.05     56m    17m
% A3-13      66  19.62       168  57.06     58m    17m
%----------------------------------
% DEPLOYMENTS for this 2014 cruise
%----------------------------------
% Target same as 2012 positions.
%NAME      Lat(N)         Long (W)      Water
%          deg min        deg min       depth
% A3-14    66  19.61      168  57.05     58m
% A2-14    65  46.86      168  34.07     56m
% A4-14    65  44.75      168  15.77     49m
%
%-----------------------
% INTERMOORING DISTANCES
%-----------------------
% A2 - A4 ~ 8nm
%-----------
% To A3 from
%-----------
%   A2  - 34nm
%   A4  - 39nm
%-------------
```

```
% To Nome from
%-------------
%   A4 - 120nm
%   CS1 - 200-220nm
%=========================================================
%
%=========================================================
% *****   HISTORIC CTD SECTIONS *****
%=========================================================
% There are 11 historic CTD lines here.
% We will not have time for all of these, but
% we will likely do a subset.  I've included
% them all, so you have the positions in advance.
% If operations/science dictate, then there
% might be different lines proposed while at sea.
%
% Naming is based on historic data.
% "+net" also refers to historic operations and
% is not relevant for this cruise.
% "no bottles" refers to historic operations and
% is not relevant for this cruise.  (No bottles
% will be taken on any CTD casts of the 2014 cruise.)
% Known Hazards are indicated.
%
% Stay a safe distance (300m?) from all deployed
% moorings.
%
% Except for around moorings or for mooring work,
% within 200m is ok for positions.
%
%======================================
% BS = Bering Strait Line (US portion)
%======================================
% - 15 stations
% - station spacing generally ~ 2nm
% Distances: - BS11-BS22 21.7nm
%            - BS22-BS24  3.1nm
% Total length 24.8nm
%--
% Time from Norseman II, 6 hrs running W, 5 hrs running E
% Time from Khromov 10.5hrs
%--------------------------------------------------
% Lat (N) Long (W)   Lat (N)      Long (W)    Name
%                   deg min     deg   min
  65.805  168.933   65  48.31   168  55.96  % BS11
  65.788  168.860   65  47.26   168  51.62  % BS12
  65.772  168.794   65  46.33   168  47.64  % BS13
  65.755  168.721   65  45.28   168  43.29  % BS14
  65.739  168.663   65  44.35   168  39.80  % BS15
  65.722  168.591   65  43.29   168  35.46  % BS16 + net
  65.704  168.521   65  42.23   168  31.28  % BS17
  65.695  168 486   65  41.70   168  29.16  % BS17S
  65.686  168.449   65  41.18   168  26.94  % BS18
  65.672  168.391   65  40.35   168  23.44  % BS19
```

```
  65.655  168.318   65  39.29   168  19.09  % BS20
  65.642  168.250   65  38.53   168  14.97  % BS21
  65.625  168.177   65  37.48   168  10.63  % BS22 + net
  65.599  168.161   65  35.96   168   9.66  % BS23
  65.582  168.117   65  34.91   168   7.00  % BS24
%
%
%===========================
% AL = A3 Line (US portion)
%==========================
% Hazards on this line:
% == First station on this line is at mooring A3-14, so exact
% position needs to be altered to be a safe distance (300m?)
% from mooring A3-14 site.
%-----------------------------------------------------
% - 13 stations including cast at A3mooring site
% - station spacing ~ 1.9nm
% Distance: - A3 to AL24 = 22.2nm
% --
% Time from Norseman II ~5.5hrs
% Time from Khromov ~9hrs
%-----------------------------------------------------
% Lat (N) Long (W)   Lat (N)      Long (W)     Name
%                    deg min      deg   min
   66.327  168.951   66  19.61    168   57.05  % A3-14
% *** Adjust this first position to be safe distance (300m?) from A3-14
   66.340  168.895   66  20.39    168   53.71  % AL13
   66.352  168.823   66  21.09    168   49.40  % AL14
   66.363  168.752   66  21.80    168   45.09  % AL15
   66.375  168.680   66  22.51    168   40.78  % AL16
   66.387  168.608   66  23.21    168   36.47  % AL17 + net
   66.399  168.536   66  23.92    168   32.16  % AL18
   66.410  168.464   66  24.63    168   27.84  % AL19
   66.422  168.392   66  25.33    168   23.53  % AL20
   66.434  168.320   66  26.04    168   19.22  % AL21
   66.446  168.249   66  26.75    168   14.91  % AL22 + net
   66.458  168.177   66  27.45    168   10.60  % AL23
   66.469  168.105   66  28.16    168    6.29  % AL24
%
%
%========================================================
% CS = Cape Serdtse Kamen to Point Hope Line (US portion)
%========================================================
% Hazards on this line:
% == Final station CS19 is shallow.  Check on
% modern charts to see if deep enough for Norseman II.
% (this station was too shallow for the Khromov, but
% was ok for the Norseman II in 2013).
%------------------------------------------------------------
% - 16 or 17 stations
% - station spacing ~ 5nm in the central Chukchi,
%                     ~ 2.2nm near the coast
% Distances: - CS10US to CS18 60.8nm
%            - CS18 to CS19    2.2nm
```

```
%--
% Time from Norseman II (toCS19) ~ 10.5 hrs
% Time from Khromov (toCS18) ~12hrs
%-----------------------------------------------------------
%     Lat (N)     Long (W)       Name
%     deg min     deg   min
0 0   67   38.1   168   56.0     % CS10US + net
0 0   67   41.7   168   48.1     % CS10.5  - no bottles
0 0   67   45.3   168   39.9     % CS11
0 0   67   48.9   168   29.4     % CS11.5  - no bottles
0 0   67   52.5   168   18.8     % CS12 + net
0 0   67   55.9   168    9.1     % CS12.5  - no bottles
0 0   67   59.3   167   59.4     % CS13
0 0   68    2.7   167   49.7     % CS13.5  - no bottles
0 0   68    6.1   167   39.9     % CS14 + net
0 0   68    9.1   167   30.7     % CS14.5  - no bottles
0 0   68   12.1   167   21.4     % CS15
0 0   68   13.6   167   16.8     % CS15.5  - no bottles
0 0   68   15.0   167   12.2     % CS16
0 0   68   16.6   167    7.6     % CS16.5  - no bottles
0 0   68   18.0   167    2.9     % CS17 + net
0 0   68   18.9   166   57.6     % CS18
0 0   68   19.9   166   52.3     % CS19 *** SHALLOW **
%                 CS19 too shallow for Khromov.
%
%
%================================================
% DL = Diomede Line (US only, 1nm east of border)
%================================================
% This line is to map eddying area north of the Diomedes
% - 19 stations
% - station spacing ~ 1nm in South,
%                    ~ 2.5nm in north
% Distance: - DL1 to DL19  28.7nm
%--
% Time from Norseman II - 5.5 hrs running N; 9hrs running S
% Time from Khromov to DL19 ~10hrs
%-----------------------------------------------
%     Lat (N)      Long (W)     Name
%     deg min      deg   min
0 0  65   49.28    168   56.2  % DL1
0 0  65   50.26    168   56.2  % DL2
0 0  65   51.23    168   56.2  % DL3
0 0  65   52.21    168   56.2  % DL4 + net
0 0  65   53.18    168   56.2  % DL5 - no bottles
0 0  65   54.15    168   56.2  % DL6
0 0  65   55.13    168   56.2  % DL7 - no bottles
0 0  65   56.10    168   56.2  % DL8
0 0  65   57.08    168   56.2  % DL9 - no bottles
0 0  65   58.05    168   56.2  % DL10
0 0  65   59.03    168   56.2  % DL11- no bottles
0 0  66    0.00    168   56.2  % DL12
0 0  66    2.55    168   56.2  % DL13- no bottles
0 0  66    5.10    168   56.2  % DL14
```

```
0 0  66    7.65    168   56.2  % DL15- no bottles
0 0  66   10.19    168   56.2  % DL16
0 0  66   12.74    168   56.2  % DL17- no bottles
0 0  66   15.29    168   56.2  % DL18
0 0  66   17.84    168   56.2  % DL19- no bottles
%
%
%========================================
% DL A and B lines (Diomede A and B lines)
%========================================
% These lines, with DL, form a grid to map
% eddying N of the Diomedes.
% - each line 12 stations
% - station spacing ~ 1nm
% Distances: - each line ~ 11nm
%--
% Estimate for NorsmanII for each line ~3.5hrs
% Time from Khromov for each line ~5hrs
%----------------------------------------
%     Lat (N)       Long (W)     Name
%     deg min       deg   min
% Northbound leg
0 0   65   49.30    168   52.2  % DLa 1
0 0   65   50.27    168   52.2  % DLa 2
0 0   65   51.25    168   52.2  % DLa 3
0 0   65   52.22    168   52.2  % DLa 4
0 0   65   53.19    168   52.2  % DLa 5
0 0   65   54.16    168   52.2  % DLa 6
0 0   65   55.14    168   52.2  % DLa 7
0 0   65   56.11    168   52.2  % DLa 8
0 0   65   57.08    168   52.2  % DLa 9
0 0   65   58.05    168   52.2  % DLa 10
0 0   65   59.03    168   52.2  % DLa 11
0 0   66    0.00    168   52.2  % DLa 12
% Southbound leg
0 0   66    0.00    168   48.2  % DLb 12
0 0   65   59.03    168   48.2  % DLb 11
0 0   65   58.05    168   48.2  % DLb 10
0 0   65   57.08    168   48.2  % DLb 9
0 0   65   56.11    168   48.2  % DLb 8
0 0   65   55.14    168   48.2  % DLb 7
0 0   65   54.16    168   48.2  % DLb 6
0 0   65   53.19    168   48.2  % DLb 5
0 0   65   52.22    168   48.2  % DLb 4
0 0   65   51.25    168   48.2  % DLb 3
0 0   65   50.27    168   48.2  % DLb 2
0 0   65   49.30    168   48.2  % DLb 1
%
%
%==========================================
% AS = from AL to CS Line
%==========================================
% Across-topography line linking Al line with CS
% - 20 stations (counting first of CS line)
```

```
% - station spacing
%        AS1-7 at ~ 4nm spacing.
%        AS7-14 at 2nm spacing,
%        A14 to end 4nm
% Distances: - AS1 to CS10 64.7nm
%--
% Time from Khromov (12casts, odds+2&18) ~11hrs
% Estimate for NorsmanII 20 casts ~ 12hrs
% Estimate for Khromov 20 casts ~ 14hrs
%---------------------------------------------
%     Lat (N)        Long (W)       Name
%     deg min        deg   min
0 0   66   41.47     167   38.86   % AS 1
0 0   66   45.01     167   43.78   % AS 2-no bottles
0 0   66   48.55     167   48.70   % AS 3
0 0   66   52.09     167   53.62   % AS 4-no bottles
0 0   66   55.63     167   58.55   % AS 5
0 0   66   59.17     168    3.47   % AS 6-no bottles
0 0   67    2.71     168    8.39   % AS 7
%                         (2nm spacing over slope)
0 0   67    4.48     168   10.85   % AS 8-no bottles
0 0   67    6.25     168   13.31   % AS 9
0 0   67    8.02     168   15.77   % AS 10-no bottles
0 0   67    9.78     168   18.23   % AS 11
0 0   67   11.55     168   20.69   % AS 12-no bottles
0 0   67   13.32     168   23.15   % AS 13
0 0   67   16.86     168   28.07   % AS 14
%                         (back to 4nm spacing)
0 0   67   20.40     168   32.99   % AS 15-no bottles
0 0   67   23.94     168   37.92   % AS 16
0 0   67   27.48     168   42.84   % AS 17-no bottles
0 0   67   31.02     168   47.76   % AS 18
0 0   67   34.56     168   52.68   % AS 19-no bottles
0 0   67   38.10     168   56.00   % CS10US
%
%
%===============================
% LIS = Cape Lisburne Line
%===============================
% - 17 stations (including first of CCL line)
% - station spacing ~ 2nm near coast,
%               ~ 3nm and ~ 5nm away from coast
% Distances: - LIS1 to CCL22 57.2nm
%--
% Time from Norseman II, ~ 10hrs
% Time from Khromov ~11hrs
%-------------------------------
%     Lat (N)        Long (W)     Name
%     deg min       deg   min
0 0   68   54.40    166   19.80  % LIS 1 + net
0 0   68   54.80    166   25.15  % LIS 2
0 0   68   55.20    166   30.51  % LIS 3
0 0   68   55.80    166   38.54  % LIS 4
0 0   68   56.40    166   46.57  % LIS 5
```

```
0 0   68   57.00    166   54.60  % LIS 6 + net
0 0   68   57.60    167    1.95  % LIS 6.5 - no bottles
0 0   68   58.20    167    9.30  % LIS 7
0 0   68   58.80    167   16.65  % LIS 7.5 - no bottles
0 0   68   59.40    167   24.00  % LIS 8
0 0   69    0.60    167   38.70  % LIS 9
0 0   69    1.80    167   53.40  % LIS 10 + net
0 0   69    1.35    168    7.95  % LIS 11
0 0   69    0.90    168   22.50  % LIS 12
0 0   69    0.45    168   37.05  % LIS 13
0 0   69    0.23    168   46.62  % LIS 14n + net
0 0   69    0.00    168   56.00  % CCL22n % was 56.2
%
%
%===============================
% CCL = Chukchi Convention Line
%===============================
% Hazards on this line:
% == First station on this line is the same as last station
% included in the LIS line above.  It does not need to be
% repeated.
% == Last station on this line is at mooring A3-14, so exact
% position needs to be altered to be a safe distance (300m?)
% from mooring A3-14 site.
% == There are 2 JAMSTEC moorings ~ 3nm east of station
% CCL16 on this line.  Those positions are:
% SCH13  68 2.002N   168 50.028W
% SCH13w 68 3.006N   168 50.003W
%----------------------------------------
% Line running from northern most point
% due south, ~ 1nm US side of conventionline
% - 20 stations (counting arriving at A3-14)
% - station spacing ~ 10nm until CCL8,
%      then reducing to ~5nm and ~2.5nm
% Distances: - CCL22 to A3-13 ~ 161nm
%--
% Time from Norseman II, 21.5hrs
% Time from Khromov ~26hrs
%----------------------------------------
%      Lat (N)        Long (W)     Name
%      deg   min      deg   min
0 0    69     0.0     168  56.0   % CCL22
0 0    68    50.0     168  56.0   % CCL21
0 0    68    40.0     168  56.0   % CCL20
0 0    68    30.0     168  56.0   % CCL19
0 0    68    20.0     168  56.0   % CCL18 + Net
0 0    68    10.0     168  56.0   % CCL17
0 0    68    00.0     168  56.0   % CCL16
0 0    67    50.0     168  56.0   % CCL15
0 0    67    38.1     168  56.0   % CCL14 (same as CS10US) + Net + Prod
%
0 0    67    30.0     168  56.0   % CCL13
0 0    67    20.0     168  56.0   % CCL12
0 0    67    10.0     168  56.0   % CCL11
```

```
0 0    67    00.0     168  56.0   % CCL10 + Net
0 0    66    50.0     168  56.0   % CCL9
0 0    66    40.0     168  56.0   % CCL8
%          - spacing now 5nm
0 0    66    35.0     168  56.0   % CCL7
0 0    66    30.0     168  56.0   % CCL6
0 0    66    25.0     168  56.0   % CCL5
%          - spacing now 2.5nm
0 0    66    22.3     168  56.0   % CCL4
0 0    66    19.61    168  57.05  % A3-13
% *** Adjust this position to be safe distance (300m?) from A3-13
%
%
%========================================
% NBS - North Bering Strait line
%========================================
% Hazards on this line:
% == Section crosses shallow waters.
% Beware of shallows from NBS9 and eastwards.
% (Helix diverted N to avoid shallows between
% stations NBS10 and NBS11)
% == Consider terminating line at NBS9
%-----------------------------------------
% Another cross strait line, run previously
% at lower resolution (i.e. without the 0.5 stations).
% - stations 9 (NBS1-9) to 16 (NBS1-9 with 0.5s)
%    to 21 (full section, including shallows).
% - station spacing (with 0.5s) ~ 1.7nm
% Distance: - NBS1-9  25.8nm
%           - NBS1-14 44.1nm
%--
% Time from Helix to NBS9, 9 casts ~5.5hrs
% - Estimate for Norseman II to NBS9, 9 casts, 6hrs
% - Estimate for Norseman II to NBS9, 16 casts, 7.5hrs
% - Estimate Khromov to NBS9, 9 casts ~6.5hrs
% - Estimate Khromo to NBS9, 16 casts ~8hrs
% Time from Helix to NBS14, 14 casts ~8.5hrs
% - Estimate for Norseman II to NBS14, 14 casts, 9hrs
% - Esimate for Norseman II to NSB14, 21 casts, 10.5hrs
% - Estimate Khromov to NBS14, 14 casts ~10hrs
% - Estimate Khromov to NBS14, 21 casts ~13hrs
%------------------------------------------
%      Lat (N)        Long (W)     Name
%      deg   min      deg   min
0 0    66     0.0     168  56.0   % NBS1 % was 58.1
0 0    66     0.0     168  53.0   % NBS1.5
0 0    66     0.0     168  49.9   % NBS2
0 0    66     0.0     168  45.8   % NBS2.5
0 0    66     0.0     168  41.6   % NBS3
0 0    66     0.0     168  37.4   % NBS3.5
0 0    66     0.0     168  33.2   % NBS4
0 0    66     0.0     168  29.1   % NBS4.5
0 0    66     0.0     168  25.0   % NBS5
0 0    66     0.0     168  20.7   % NBS5.5
```

```
0 0    66     0.0     168  16.4   % NBS6
0 0    66     0.0     168  12.4   % NBS6.5
0 0    66     0.0     168   8.4   % NBS7
0 0    66     0.0     168   4.2   % NBS7.5
0 0    66     0.0     168   0.0   % NBS8 - 34m water
0 0    66     0.0     167  55.1   % NBS9 - 20m water
%  (consider terminating line here)
0 0    66     0.0     167  52.0   % NBS10 - 12m water
% (Helix diverted N to avoid shallows between these stations)
0 0    66     0.0     167  40.1   % NBS11 - 15m water
0 0    66     0.0     167  29.1   % NBS12 - 18m water
0 0    66     0.0     167  18.1   % NBS13 - 13m water
0 0    66     0.0     167  10.2   % NBS14 - 10m water
%
%
%======================================
% MBSn = Mid Bering Strait line (new)
%======================================
% Just north of the Bering Strait line
% - 14 stations
% - station spacing 1.7nm, less near coast
% Distance: - 21.0nm total
%--
% Time from Helix (8casts only) ~2.5hrs
% - Estimate Norseman II (8 casts only) ~ 4hrs
% - Estimate Norseman II (14 casts)  ~ 6hrs
% - Estimate Khromov (8casts only)~5.5hrs
% - Estimate Khromov (14casts) ~7hrs
%---------------------------------------
%      Lat (N)        Long (W)     Name
%      deg   min      deg   min
0 0    65    52.1     168  56.0   % MBSn1 % was 57.0
0 0    65    52.0     168  52.5   % MBSn1.5
0 0    65    51.9     168  49.1   % MBSn2
0 0    65    51.8     168  45.0   % MBSn2.5
0 0    65    51.7     168  40.9   % MBSn3
0 0    65    51.6     168  36.4   % MBSn3.5
0 0    65    51.5     168  31.9   % MBSn4 % was 51.6
0 0    65    51.4     168  27.5   % MBSn4.5
0 0    65    51.3     168  23.0   % MBSn5 % was 51.4
0 0    65    51.2     168  18.5   % MBSn5.5
0 0    65    51.1     168  13.9   % MBSn6
0 0    65    51.1     168  10.4   % MBSn6.5
0 0    65    51.0     168   6.9   % MBSn7
0 0    65    50.9     168   5.0   % MBSn8
%
%
%========================================================
%========================================================
% NEW LINES ADDED DURING CRUISE
%=======================================================
%
%--------------------------------
% HIGHER RESOLUTION BSTRAIT LINE
```

```
%--------------------------------
% As per the previous BStrait line, but adding in
% extra half stations all across the strait
%
%          Lat(N)          Lon(W)
%          Deg   Min   Deg   Min
65.805     168.933    65    48.31 168   55.96 %     BS11
65.797     168.897    65    47.79 168   53.79 %     BS11J      Jim
65.788     168.86     65    47.26 168   51.62 %     BS12
65.780     168.827    65    46.8  168   49.63 %     BS12AJ     AJ
65.772     168.794    65    46.33 168   47.64 %     BS13
65.764     168.758    65    45.81 168   45.47 %     BS13Z      Zack
65.755     168.721    65    45.28 168   43.29 %     BS14
65.747     168.692    65    44.82 168   41.55 %     BS14J      Jorin
65.739     168.663    65    44.35 168   39.8  %     BS15
65.731     168.627    65    43.82 168   37.63 %     BS15J      Jack
65.722     168.591    65    43.29 168   35.46 %     BS16
65.713     168.556    65    42.76 168   33.37 %     BS16J      Jim
65.704     168.521    65    42.23 168   31.28 %     BS17
65.695     168.486    65    41.7  168   29.16 %     BS17S      Scotty
65.686     168.449    65    41.18 168   26.94 %     BS18
65.679     168.42     65    40.77 168   25.19 %     BS18J      Joanne
65.672     168.391    65    40.35 168   23.44 %     BS19
65.664     168.355    65    39.82 168   21.27 %     BS19H      Harry
65.655     168.318    65    39.29 168   19.09 %     BS20
65.649     168.284    65    38.91 168   17.03 %     BS20J      John
65.642     168.25     65    38.53 168   14.97 %     BS21
65.634     168.214    65    38.01 168   12.8  %     BS21A      Andy
65.625     168.177    65    37.48 168   10.63 %     BS22
65.599     168.161    65    35.96 168   9.66  %     BS23
65.582     168.117    65    34.91 168   7     %     BS24
%
%=====================================
% New SBS (South Bering Strait) line
%=====================================
% Starts from BS24 and runs SE back across the
% ACC.
% --- Length to SBS2 to SBS8 = 13.4nm, 7 stations
%
% Lat (N)        Lon (W)
%Deg  Min        Deg  Min
65   34.91       168  7.00  % SBS1 (same as BS24)
65   33.93       168  11.85 % SBS2
65   32.95       168  16.70 % SBS3
65   31.96       168  21.55 % SBS4
65   30.98       168  26.40 % SBS5
65   30.00       168  31.26 % SBS6
65   29.02       168  36.11 % SBS7
65   28.03       168  40.96 % SBS8
65   27.05       168  45.81 % SBS9  (not taken in 2014)
65   26.07       168  50.66 % SBS10 (not taken in 2014)
65   25.09       168  55.51 % SBS11 (not taken in 2014) %
%=======================================================
```

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% Bering Strait 2014 NORSEMAN2 log CTD

%example from 2013

%Date	Time	1	Cast NO	Down	Depth (m)	Lat (deg)	Lat (min)	Lon (deg)	Lon(min)	%	StationID	Windspeed	Winddir	Operator	Comments
20130704	0627	1	**1**	1	52.5	65	21.690	167	53.450	**%**	testcast	14.4	182	ACPF	Test cast en route to BS line
20130704	0635	1	**1**	2	52.5	65	21.000	167	53.650	**%**		5.7	51	ACPF	1, 5 ans 6 are leaking
20130704	0713	1	**2**	1	42.2	65	25.100	167	59.270	**%**	testcast2	15.6	197	ACPF	This is to test bottles - All bottles OK
20130704	0721	1	**2**	2	42.2	65	25.175	167	59.260	**%**				ACPF	

%Date	**Time**	**1**	**Cast NO**	**Down**	**Depth (m)**	**Lat (deg)**	**Lat (min)**	**Lon (deg)**	**Lon(min)**	**%**	**StationID**	**Windspeed**	**Winddir**	**Operator**	**Comments**
%Please fill in all data for every event (CTD/net tow)										%					
%There should be one line for the beginning of the event and one line for the end										%					
%Date is GMT and has the format yyyymmdd										%					
%Time is GMT and has the format hhmm										%					
%Ty=Type: 1=CTD / 2=Net tow/4=prod cast x										%	THIS YEAR WE ONLY HAVE TYPE 1				
%#,Number is consecutive for that event type										%					
%In/out (I/O): 1=In / 2=Out										%					
%Dep=waterdepth(m) from Furuno readout by CTD which is depth below keel, keel is 3m (10ft)															
%LatD and LatM are Latitude Degrees and Minute and are positive N										%					
%LonD and LonM are Longitude Degrees and Min and are positive W										%					
%St is the name of the station (Line ID then station number)										%					
% SS = CTD operator estimate of sea state (Beaufort Scale)															
%WSp=wind speed in m/s; WD=Wind direction from bridge															
%Op=CTD operator															
% when 3 lines for NET, dep indicates wire out for net															
%Fill in any comments if needed.										%					

												Knots	deg (0=N)		
%Date	**Time**	**1**	**Cast NO**	**Down**	**Depth (m)**	**Lat (deg)**	**Lat (min)**	**Lon (deg)**	**Lon(min)**	**%**	**StationID**	**Windspeed**	**Winddir**	**Operator**	**Comments**
20140630	2035	1	1	1	17.3	64	43.774	166	41.009	%	dry test	3.4	217	atn	dry test to learn CTD driving
20140630	2045	1	1	2	17.1	64	44.855	166	43.033	%	dry test	4.6	214	atn	surface only as pump didn't work
% put in water, but pump didn't come on. Tried several things, brought it on board, overwrote those test, finally got pump turned on manually in air (saved as cast 2)															
20140630	*2151*	1	2	1		64		166		%	dry test			RJD	final dry test with pump on manually in air
20140630	*2155*	1	2	2		64		166		%	dry test			RJD	
20140630	*2250*	1	3	1		64		166		%	wet test			RJD	try again in water automatically, pump not on
20140630	*2251*	1	3	2		64		166		%	wet test			RJD	
20140630	*2252*	1	4	1		64	57.255	167		%	wet test	calm		RJD	stll in water, turned on pumps manually, went to depth
20140630	2259	1	4	2	10.7	64	57.36	167	4.63	%	wet test			RJD	altimeter ok
% Noticed previous casts were with old cal, updated cals to 2012															
20140701	*43*	1	5	1	17.4	65		167		%	wet test			ACPF	try again for automatic pump, but didn't work
20140701	*46*	1	5	2		65		167		%	wet test			ACPF	
20140701	*48*	1	6	1	17.2	65	8.05	167	25.67	%	wet test			ACPF	still in water, redo manually, ok
20140701	*54*	1	6	2		65		167		%	wet test			ACPF	BUT altimeter does not change with depth
% altimeter stuck at 18m (close to range from surface), but didn't change with depth - so moved altimeter down															
20140701	102	1	7	1	17.1	65	8	167	25	%	wet test			ACPF	testing lowered altimter - still bad
20140701	*103*	1	7	2		65		167		%	wet test			ACPF	
% decide can live with turning pump on manually, as obvious things don't make automatic work - **** TEST THIS BACK IN SEATTLE***															
% trying to fix altimeter - added extra 20lbs weight (in case wasn't straight in water), replugged cables															
20140701	1542	1	8	1	44.5	65	44.63	168	15.16	%	Calcast recovery site A4_13			ACPF	To 45 m. Altimeter reading 99m, winch wo ok to within 2m
20140701	1545	1	8	2		65	44.87	168	15.14	%					
20140701	1658	1	9	1	52.9	65	46.72	168	33.9	%	Cal cast recovery site A2			ACPF	To 54 m. Altimeter ok at surface, then stuck.
20140701	1701	1	9	2		65	46.88	168	33.9	%					(Altimeter connectors cleaned pre cast)
% Here we added the turbidity measurements (Calib as of March 11, 2010) to the table plot (upper right). There is no graph of turbidity.															
% We have updated xmlcom file and psa files to Version 3 (BStrait2014vers30thJune2014_v3.psa and *_v3.xmlcom)															
20140702	102	1	10	1	54.3	66	19.709	168	57.13	%	Cal cast recovery site A3	20.9	186	RJD	
20140702	108	1	10	2	54.4	66	19.919	168	57.22	%		14.2	169.5	RJD	
20140702	1930	1	11	1	54.4	66	19.635	168	56.855	%	Cal cast deployment A3	15.7	202	ACPF	
20140702	1935	1	11	2	54.4	66	19.767	168	56.892	%		14.4	193	atn	
20140703	105	1	12	1	53.2	65	46.805	168	33.782	%	Cal cast deployment A2	14.8	192	RJD	
20140703	109	1	12	2	54.2	65	46.957	168	33.678	%	Cal cast deployment A2	14.9	192	RJD	

20140703	234	1	13	1	44.9	65	44.72	168	15.207	%	Cal cast deployment A4	18.4	206	RJD	
20140703	237	1	13	2	45	65	44.83	168	15.157	%	Cal cast deployment A4	18.8	196	RJD	
20140703	451	1	14	1	27.9	65	35.025	168	7.447	%	BS24	10.9	168	atn	very fast current
20140703	454	1	14	2	28.5	65	35.122	168	7.685	%	BS24	16.6	152	atn	
20140703	504	1	15	1	30.3	65	36.092	168	9.96	%	BS23	17.4	172	atn	
20140703	506	1	15	2	30.7	65	36.203	168	10.278	%	BS23	18.3	164	atn	
20140703	518	1	16	1	29.5	65	37.484	168	10.622	%	BS22	19	185	atn	
20140703	518	1	16	2	29.8	65	37.589	168	10.689	%	BS22	19.8	189	atn	
20140703	539	1	17	1	40.2	65	38.594	168	14.94	%	BS21	19.8	176	atn	
20140703	541	1	17	2	40.4	65	38.681	168	14.977	%	BS21	19.1	177	atn	
20140703	557	1	18	1	46.4	65	39.271	168	19.001	%	BS20	15.8	190	atn	
20140703	600	1	18	2	46.6	65	39.359	168	19.008	%	BS20	18.4	183	atn	
20140703	618	1	19	1	49.8	65	40.323	168	23.518	%	BS19	17.7	193	atn	
20140703	620	1	19	2	49.9	65	40.412	168	23.551	%	BS19	17.8	190	atn	
20140703	642	1	20	1	51.8	65	41.144	168	26.929	%	BS18	16.6	187	atn	
20140703	645	1	20	2	52.5	65	41.235	168	26.937	%	BS18	16.8	184	atn	BStrait14020.hdr error: station should be BS18, not BS20
20140703	658	1	21	1	52.1	65	41.687	168	29.004	%	BS17S	16.1	185	atn	
20140703	701	1	21	2	51.6	65	41.782	168	28.978	%	BS17S	16.5	188	atn	
20140703	713	1	22	1	52.9	65	42.183	168	31.347	%	BS17	15.4	187	atn	
20140703	716	1	22	2	53	65	42.238	168	31.39	%	BS17	15.4	187	atn	
20140703	737	1	23	1	49.9	65	43.269	168	35.537	%	BS16	15.5	196	atn	
20140703	739	1	23	2	50	65	43.352	168	35.56	%	BS16	16.2	190	atn	
20140703	803	1	24	1	50.2	65	44.367	168	40.032	%	BS15	14.1	187	atn	
20140703	806	1	24	2	50.2	65	44.433	168	39.932	%	BS15	15	193	atn	
20140703	824	1	25	1	51.1	65	45.273	168	43.331	%	BS14	16.4	193	atn	
20140703	826	1	25	2	51.1	65	45.329	168	43.379	%	BS14	17.3	188	atn	
20140703	847	1	26	1	50.1	65	46.351	168	47.607	%	BS13	17.3	186	atn	
20140703	849	1	26	2	50.1	65	46.432	168	47.672	%	BS13	17.1	184	atn	
20140703	910	1	27	1	42.9	65	47.245	168	51.597	%	BS12	24	181	atn	
20140703	913	1	27	2	42.8	65	47.313	168	51.643	%	BS12	24.8	178	atn	
20140703	932	1	28	1	45.6	65	48.316	168	55.867	%	BS11	20.7	192	atn	T/S vertically constant!
20140703	934	1	28	2	45.7	65	48.396	168	55.879	%	BS11	24.1	190	atn	
20140703	944	1	29	1	45.8	65	49.279	168	56.099	%	DL1	19.6	188	atn	T/S still near constant vertically
20140703	946	1	29	2	45.9	65	49.366	168	56.021	%	DL1	20.8	188	atn	
20140703	956	1	30	1	45.8	65	50.264	168	56.32	%	DL2	13.9	183	atn	
20140703	958	1	30	2	45.9	65	50.336	168	56.413	%	DL2	14.3	177	atn	T/S suspiciously constant…,
20140703	1009	1	31	1	46.5	65	51.256	168	56.227	%	DL3	10.7	222	atn	
20140703	1011	1	31	2	46.5	65	51.338	168	56.272	%	DL3	11.3	191	atn	
20140703	1028	1	32	1	44.3	65	52.226	168	56.258	%	DL4	13.7	191	atn	
20140703	1030	1	32	2	44	65	52.268	168	56.329	%	DL4	14.2	173	atn	
20140703	1041	1	33	1	46.5	65	53.172	168	56.218	%	DL5	10.6	198	atn	
20140703	1044	1	33	2	46.7	65	53.243	168	56.291	%	DL5	13.3	189	atn	
20140703	1055	1	34	1	47.2	65	54.152	168	56.173	%	DL6	9.5	189	atn	
20140703	1058	1	34	2	47.1	65	54.253	168	56.148	%	DL6	14.4	196	atn	
20140703	1108	1	35	1	47.6	65	55.133	168	56.177	%	DL7	9.5	194	atn	
20140703	1110	1	35	2	47.4	65	55.208	168	56.239	%	DL7	8.9	189	atn	
20140703	1121	1	36	1	48.1	65	56.114	168	56.185	%	DL8	10.5	214	atn	nice reversal of T (colder at surface)
20140703	1123	1	36	2	48.2	65	56.202	168	56.224	%	DL8	9.4	198	atn	upcast quite different near surface
20140703	1133	1	37	1	49.1	65	57.097	168	56.201	%	DL9	12.5	202	atn	
20140703	1136	1	37	2	49.1	65	57.185	168	56.227	%	DL9	11.8	192	atn	
20140703	1145	1	38	1	50.1	65	58.064	168	56.202	%	DL10	14.3	207	atn	
20140703	1148	1	38	2	50.1	65	58.151	168	56.223	%	DL10	16.4	202	atn	upcast catching warmer water..
20140703	1157	1	39	1	50.5	65	59.048	168	56.179	%	DL11	14.3	208	atn	
20140703	1200	1	39	2	50.4	65	59.162	168	56.198	%	DL11	13.5	201	atn	
20140703	1210	1	40	1	50.9	66	0.03	168	56.2	%	DL12	14.7	209	ACPF	
20140703	1212	1	40	2	50.9	66	0.08	168	56.2	%	DL12	14.4	196	ACPF	
% Wrong xmlcon file (BStrait14031, instead of *_v3.xmlcon) on casts prior to this. Corrected here.															
20140703	1232	1	41	1	51.2	66	2.56	168	56.24	%	DL13	15.5	205	ACPF	Stations more spaced now.

20140703	1235	1	41	2	51.2	66	2.66	168	56.3	%	DL13	15.3	196	ACPF	
20140703	1255	1	42	1	53.1	66	5.11	168	56.2	%	DL14	16.2	204	ACPF	T-S ~ constant with depth, but T1=T2, S1=S2. Is ok.
20140703	1257	1	42	2	53.2	66	5.19	168	56.22	%	DL14	16	194	ACPF	
20140703	1316	1	43	1	53.1	66	7.66	168	56.2	%	DL15	18.1	201	ACPF	Water column well T-S mixed.
20140703	1319	1	43	2	53	66	7.75	168	56.24	%	DL15	17.8	191	ACPF	
20140703	1337	1	44	1	52.9	66	10.2	168	56.11	%	DL16	13.6	202	ACPF	Finally some T-S structure here, with halocline.
20140703	1340	1	44	2	53.1	66	10.31	168	56.09	%	DL16	20.5	196	ACPF	
20140703	1358	1	45	1	55.3	66	12.73	168	56.23	%	DL17	22.2	207	ACPF	Winds and swell picking up…
20140703	1400	1	45	2	54.7	66	12.8	168	56.27	%	DL17	20.7	190	ACPF	
20140703	1420	1	46	1	55.7	66	15.37	168	56.09	%	DL18	20.5	208	ACPF	Big swell, stopped well above bottom (at 51 m)
20140703	1423	1	46	2	55.6	66	15.43	168	56.06	%	DL18	18.9	210	ACPF	
20140703	1441	1	47	1	54.6	66	17.98	168	56.09	%	DL19	19	201	ACPF	Swell calmed. Likely touched bottom, but package ok on recovery.
20140703	1444	1	47	2	54.7	66	18.05	168	56.09	%	DL19	18.5	203	ACPF	END OF DL line
20140703	1458	1	48	1	54.6	66	19.73	168	56.99	%	A3-14	20.9	193	ACPF	START OF AL line NE bound
20140703	1500	1	48	2	54.4	66	19.79	168	56.96	%	A3-14	22.1	190	ACPF	** Hdr files have wrong station IDs on this line (1 station off).
20140703	1513	1	49	1	54.1	66	20.496	168	53.647	%	AL13	22.8	188	RJD	
20140703	1517	1	49	2	54.3	66	20.615	168	53.701	%	AL13	22.7	190	RJD	
20140703	1533	1	50	1	53.6	66	21.16	168	49.46	%	AL14	18.2	197	ACPF	
20140703	1535	1	50	2	53.3	66	21.217	168	49.44	%	AL14	23.6	199	ACPF	
20140703	1550	1	51	1	45.7	66	21.84	168	45.21	%	AL15	20.7	194	ACPF	
20140703	1553	1	51	2	46	66	21.91	168	45.17	%	AL15	23.1	190	ACPF	
20140703	1609	1	52	1	56.2	66	22.53	168	40.95	%	AL16	16.3	201	ACPF	Winds and seas calming down quite fast
20140703	1612	1	52	2	56	66	22.58	168	40.93	%	AL16	18.8	208	ACPF	
20140703	1628	1	53	1	54	66	23.26	168	36.55	%	AL17	16.5	185	ACPF	very smooth profile
20140703	1631	1	53	2	54	66	23.31	168	36.62	%	AL17	17	193	ACPF	
20140703	1649	1	54	1	51.6	66	23.97	168	32.28	%	AL18	15.6	188	ACPF	
20140703	1652	1	54	2	51.9	66	23.98	168	32.35	%	AL18	16.4	193	ACPF	
20140703	1709	1	55	1	52.6	66	24.69	168	27.9	%	AL19	14.9	183	ACPF	Homogeneous T&S all through depth
20140703	1712	1	55	2	52.6	66	24.71	168	27.94	%	AL19	14.9	183	ACPF	
20140703	1727	1	56	1	51.2	66	25.36	168	23.62	%	AL20	16.7	185	ACPF	Nearly-homogeneous T&S all through depth
20140703	1730	1	56	2	51.2	66	25.39	168	23.65	%	AL20	16.2	180	ACPF	
20140703	1743	1	57	1	46.5	66	26	168	19.37	%	AL21	16.2	194	ACPF	
20140703	1746	1	57	2	46.3	66	26.01	168	19.31	%	AL21	17	200	ACPF	
20140703	1800	1	58	1	39.6	66	26.71	168	14.95	%	AL22	16.4	194	ACPF	
20140703	1802	1	58	2	39.4	66	26.73	168	14.9	%	AL22	19.4	198	ACPF	
20140703	1815	1	59	1	32.3	66	27.42	168	10.72	%	AL23	18.5	200	ACPF	
20140703	1817	1	59	2	32.3	66	27.42	168	10.67	%	AL23	18.5	200	ACPF	
20140703	1834	1	60	1	26	66	28.23	168	6.14	%	AL24	19.4	190	ACPF	Hdr file has Al24ok. Calmer, Perhaps touched bottom.
20140703	1836	1	60	2	26	66	28.24	168	6.18	%	AL24	19.1	191	ACPF	END OF AL line…
20140704	204	1	61	1	48.7	67	38.009	168	55.984	%	CS10US	16.5	174	RJD	START OF CS line NE bound
20140704	207	1	61	2	48.7	67	38.117	168	55.738	%	CS10US	16.6	172	RJD	
20140704	236	1	62	1	48.5	67	40.678	168	48.114	%	CS10.5	16.2	171	RJD	
20140704	238	1	62	2	48.3	67	40.733	168	48.094	%	CS10.5	17.6	183	RJD	
20140704	319	1	63	1	48.5	67	45.263	168	39.943	%	CS11	14.1	191	RJD	
20140704	322	1	63	2	48.5	67	45.298	168	39.913	%	CS11	13.7	180	RJD	
20140704	404	1	64	1	49.4	67	48.886	168	29.529	%	CS11.5	12.4	145	RJD	
20140704	406	1	64	2	49.3	67	48.929	168	29.52	%	CS11.5	9.7	148	RJD	
20140704	446	1	65	1	54.6	67	52.467	168	18.977	%	CS12	17.2	164	atn	
20140704	448	1	65	2	54.7	67	52.489	168	18.936	%	CS12	16.5	179	atn	
20140704	525	1	66	1	57.5	67	55.847	168	9.285	%	CS12.5	18.9	173	atn	
20140704	528	1	66	2	57.2	67	55.882	168	9.277	%	CS12.5	17.1	174	atn	
20140704	606	1	67	1	52.9	67	59.267	167	59.58	%	CS13	15.8	146	atn	
20140704	609	1	67	2	53.2	67	59.311	167	59.642	%	CS13	14.5	152	atn	
20140704	648	1	68	1	52.2	68	2.667	167	49.877	%	CS13.5	19.4	159	atn	
20140704	651	1	68	2	52.3	68	2.706	167	49.882	%	CS13.5	18	165	atn	ship moved on upcast for wire angle. Note zigzag on upcast.
20140704	728	1	69	1	50.9	68	6.06	167	40.057	%	CS14	19.4	161	atn	7degC water!
20140704	730	1	69	2	50.6	68	6.104	167	40.1	%	CS14	17.9	165	atn	
20140704	807	1	70	1	47	68	9.078	167	30.856	%	CS14.5	19.3	178	atn	

20140704	809	1	70	2	47.2	68	9.122	167	30.815	%	CS14.5	18.8	185	atn	
20140704	852	1	71	1	46.1	68	12.06	167	21.527	%	CS15	16.8	181	atn	
20140704	854	1	71	2	46.1	68	12.081	167	21.492	%	CS15	17.8	190	atn	
20140704	912	1	72	1	44.3	68	13.553	167	16.894	%	CS15.5	16.7	183	atn	
20140704	915	1	72	2	44.7	68	13.572	167	16.832	%	CS15.5	16.8	191	atn	
20140704	933	1	73	1	43.2	68	14.958	167	12.262	%	CS16	15.4	182	atn	
20140704	935	1	73	2	43.3	68	14.976	167	12.204	%	CS16	15.7	189	atn	
20140704	954	1	74	1	40.1	68	16.555	167	7.669	%	CS16.5	14.2	171	atn	
20140704	956	1	74	2	40.1	68	16.568	167	7.602	%	CS16.5	14.3	193	atn	
20140704	1013	1	75	1	37.1	68	17.964	167	2.991	%	CS17	16.5	190	atn	
20140704	1015	1	75	2	36.5	68	17.976	167	2.929	%	CS17	17.4	186	atn	
20140704	1034	1	76	1	32.4	68	18.893	166	57.748	%	CS18	14.1	193	atn	
20140704	1036	1	76	2	32.1	68	18.912	166	57.773	%	CS18	14.1	192	atn	
20140704	1100	1	77	1	25.1	68	19.867	166	52.465	%	CS19	14.9	180	atn	
20140704	1103	1	77	2	25.3	68	19.886	166	52.525	%	CS19	12.9	182	atn	END OF CS line
20140704	1615	1	78	1	26.3	68	54.45	166	19.85	%	LIS1	15.9	192	ACPF	START OF LIS line W-bound
20140704	1617	1	78	2	26.5	68	54.48	166	19.84	%	LIS1	15.6	187	ACPF	deeper (~25m) thermoclines
20140704	1631	1	79	1	31	68	54.82	166	25.13	%	LIS2	15.4	197	ACPF	deeper (~25m) thermoclines
20140704	1634	1	79	2	30.9	68	54.82	166	25.16	%	LIS2	15.5	196	ACPF	
20140704	1648	1	80	1	32.2	68	55.26	166	30.48	%	LIS3	13.3	190	ACPF	
20140704	1650	1	80	2	32.4	68	55.21	166	30.59	%	LIS3	15.6	195	ACPF	
20140704	1710	1	81	1	40.1	68	55.82	166	38.5	%	LIS4	15.8	187	ACPF	Half a s blanking of screen during upcast near surface. Out of water?
20140704	1712	1	81	2	40.1	68	55.84	166	38.53	%	LIS4	15.4	185	ACPF	
20140704	1733	1	82	1	44.3	68	56.44	166	46.54	%	LIS5	16.7	179	ACPF	
20140704	1736	1	82	2	44.2	68	56.47	166	46.56	%	LIS5	17.9	183	ACPF	
20140704	1758	1	83	1	45.2	68	56.98	166	54.56	%	LIS6	16.5	199	ACPF	
20140704	1800	1	83	2	45.2	68	57	166	54.5	%	LIS6	16.6	186	ACPF	
20140704	1820	1	84	1	45.2	68	57.61	167	1.2	%	LIS6.5	15.6	188	ACPF	Hdr mislabelled as LIS7, but correct is LIS6.5
20140704	1823	1	84	2	44.9	68	57.62	167	1.22	%	LIS6.5	16.8	184	ACPF	
20140704	1844	1	85	1	45.1	68	58.23	167	9.29	%	LIS7	17	180	ACPF	
20140704	1846	1	85	2	45.1	68	58.24	167	9.3	%	LIS7	16.7	193	ACPF	
20140704	1906	1	86	1	45.3	68	58.82	167	16.57	%	LIS7.5	15.5	184	ACPF	
20140704	1908	1	86	2	45.3	68	58.83	167	16.62	%	LIS7.5	18	178	ACPF	
20140704	1927	1	87	1	45.8	68	59.41	167	23.95	%	LIS8	14.3	188	ACPF	
20140704	1930	1	87	2	45.9	68	59.41	167	23.97	%	LIS8	16.6	187	ACPF	
20140704	2015	1	88	1	47.1	69	0.643	167	38.767	%	LIS9	16.5	175	RJD	
20140704	2018	1	88	2	47.3	69	0.678	167	38.707	%	LIS9	17.3	192	RJD	
20140704	2056	1	89	1	47.7	69	1.808	167	53.356	%	LIS10	13.4	187	RJD	
20140704	2058	1	89	2	47.8	69	1.83	167	53.264	%	LIS10	15.9	173	RJD	
20140704	2136	1	90	1	48.5	69	1.36	168	7.927	%	LIS11	13.9	183	RJD	Hex file lost (2 copies of seasave open?)
20140704	2138	1	90	2	48.7	69	1.388	168	7.9	%	LIS11	14.1	180	RJD	
20140704	2205	1	91	1	48.6	69	1.386	168	8.062	%	LIS11	15.7	183	RJD	recast of LIS11
20140704	2208	1	91	2	48.6	69	1.427	168	8.012	%	LIS11	14.5	185	RJD	
20140704	2245	1	92	1	49	69	0.901	168	22.4	%	LIS12	15.8	167	RJD	
20140704	2247	1	92	2	49	69	0.93	168	22.436	%	LIS12	12.6	177	RJD	
20140704	2323	1	93	1	50.2	69	0.443	168	36.989	%	LIS13	14.3	177	RJD	
20140704	2325	1	93	2	50.7	69	0.46	168	36.927	%	LIS13	11.5	167	RJD	
20140704	2353	1	94	1	50.9	69	0.241	168	46.666	%	LIS14	15.8	168	RJD	
20140704	2355	1	94	2	50.8	69	0.274	168	46.707	%	LIS14	14.3	167	RJD	END OF LIS line
20140705	19	1	95	1	51	69	59.982	168	55.922	%	CCL22	12.7	173	RJD	START OF CCL line S bound
20140705	21	1	95	2	51.1	69	0.002	168	55.931	%	CCL22	11.4	171	RJD	
20140705	144	1	96	1	51.6	68	50.031	168	55.976	%	CCL21	13.8	190	RJD	
20140705	147	1	96	2	51.6	68	50.067	168	55.905	%	CCL21	13.9	188	RJD	
20140705	327	1	97	1	51.3	68	40.074	168	55.999	%	CCL20	13	184	RJD	
20140705	331	1	97	2	51.3	68	40.05	168	56.089	%	CCL20	13.1	194	RJD	
20140705	452	1	98	1	53.4	68	30.057	168	56.012	%	CCL19	10.8	189	atn	
20140705	454	1	98	2	53.2	68	30.033	168	56.127	%	CCL19	11.5	191	atn	
20140705	615	1	99	1	54.4	68	20.07	168	56.038	%	CCL18	10.9	181	atn	

20140705	618	1	99	2	54.5	68	20.04	168	56.152	%	CCL18	9.3	190	atn	Sucked up something at depth? (S spike upcast)
20140705	736	1	100	1	56	68	10.054	168	56.044	%	CCL17	6.8	184	atn	
20140705	739	1	100	2	56.1	68	10.008	168	56.177	%	CCL17	7.3	182	atn	
20140705	858	1	101	1	55.8	68	0.055	168	56.025	%	CCL16	6.9	141	atn	
20140705	901	1	101	2	55.7	67	59.98	168	56.102	%	CCL16	6.4	155	atn	
20140705	1016	1	102	1	49.2	67	50.067	168	56.014	%	CCL15	5.5	134	atn	
20140705	1019	1	102	2	49.3	67	50.005	168	56.05	%	CCL15	5.2	137	atn	
20140705	1146	1	103	1	48.7	67	38.232	168	56.084	%	CCL14	4.5	133	atn	
20140705	1148	1	103	2	48.7	67	38.251	168	56.227	%	CCL14	2.9	141	atn	
20140705	1249	1	104	1	48.3	67	30.4	168	55.99	%	CCL13	4.1	154	ACPF	
20140705	1251	1	104	2	48.3	67	30.01	168	56.02	%	CCL13	3.9	165	ACPF	
20140705	1405	1	105	1	47.9	67	20.07	168	55.99	%	CCL12	1.5	317	ACPF	
20140705	1407	1	105	2	47.9	67	19.98	168	55.91	%	CCL12	1.7	322	ACPF	
20140705	1516	1	106	1	47.1	67	10.06	168	55.99	%	CCL11	2.6	112	ACPF	
20140705	1518	1	106	2	47.1	67	10.07	168	55.88	%	CCL11	2.8	7.1	ACPF	
20140705	1630	1	107	1	46.1	66	59.99	168	56.03	%	CCL10	1.5	82	ACPF	
20140705	1632	1	107	2	46.1	66	59.97	168	55.96	%	CCL10	2	74	ACPF	
20140705	1743	1	108	1	43.2	66	50.08	168	56	%	CCL9	1.7	301	ACPF	
20140705	1745	1	108	2	43.3	66	49.98	168	55.9	%	CCL9	1.3	289	ACPF	
20140705	1854	1	109	1	41.9	66	39.99	168	56.02	%	CCL8	6.4	289	ACPF	
20140705	1856	1	109	2	41.8	66	39.94	168	56.22	%	CCL8	7.4	296	ACPF	
20140705	1932	1	110	1	44.3	66	35.02	168	56.1	%	CCL7	7.1	317	ACPF	
20140705	1935	1	110	2	44.2	66	34.98	168	56.18	%	CCL7	6.7	315	ACPF	
20140705	2010	1	111	1	55	66	30.003	168	56.058	%	CCL6	4.4	349	RJD	
20140705	2013	1	111	2	55.1	66	29.964	168	56.186	%	CCL6	4.8	356	RJD	
20140705	2047	1	112	1	54.6	66	24.977	168	56.152	%	CCL5	4.8	346	RJD	
20140705	2050	1	112	2	54.9	66	24.943	168	56.358	%	CCL5	5.2	350	RJD	
20140705	2109	1	113	1	53.9	66	22.301	168	56.112	%	CCL4	4.5	6	RJD	
20140705	2112	1	113	2	53.8	66	22.323	168	56.23	%	CCL4	5.1	13	RJD	
20140705	2131	1	114	1	54.4	66	19.686	168	56.894	%	A3	3.5	16	RJD	
20140705	2134	1	114	2	54.4	66	19.706	168	56.97	%	A3	3.7	11	RJD	END OF CCL line
20140705	2151	1	115	1	54.9	66	17.847	168	56.162	%	DL19	1.8	12	RJD	Start of DL line S bound
20140705	2153	1	115	2	54.8	66	17.899	168	56.115	%	DL19	1.5	348	RJD	
20140705	2215	1	116	1	55.8	66	15.284	168	56.316	%	DL18	1.2	306	RJD	
20140705	2217	1	116	2	55.8	66	15.308	168	56.529	%	DL18	0.9	335	RJD	
20140705	2237	1	117	1	55.4	66	12.724	168	56.272	%	DL17	3.2	344	RJD	
20140705	2240	1	117	2	55.4	66	12.664	168	56.331	%	DL17	3.7	346	RJD	
20140705	2300	1	118	1	54.3	66	10.183	168	56.15	%	DL16	6.1	334	RJD	
20140705	2302	1	118	2	54.3	66	10.222	168	56.166	%	DL16	6.1	327	RJD	
20140705	2324	1	119	1	52.9	66	7.615	168	56.294	%	DL15	1.4	4	RJD	
20140705	2326	1	119	2	52.9	66	7.55	168	56.283	%	DL15	4	345	RJD	
20140705	2344	1	120	1	53.9	66	5.145	168	56.23	%	DL14	2.1	27	RJD	
20140705	2348	1	120	2	53.3	66	5.126	168	56.42	%	DL14	2.275	31	RJD	
20140706	7	1	121	1	51.5	66	2.548	168	56.14	%	DL13	5.9	343	RJD	
20140706	9	1	121	2	51.3	66	2.597	168	56.001	%	DL13	5.6	342	RJD	
20140706	31	1	122	1	50.9	66	0.015	168	56.287	%	DL12	5.5	318	RJD	
20140706	34	1	122	2	50.8	65	59.999	168	56.361	%	DL12	5.6	318	RJD	
20140706	43	1	123	1	50.8	65	58.009	168	56.283	%	DL11	6.3	320	RJD	
20140706	46	1	123	2	50.4	65	58.979	168	56.339	%	DL11	6.1	322	RJD	
20140706	54	1	124	1	50.3	65	58.083	168	56.166	%	DL10	6	317	RJD	
20140706	57	1	124	2	50.4	65	58.049	168	56.163	%	DL10	6.6	323	RJD	
20140706	106	1	125	1	49.4	65	57.124	168	56.136	%	DL9	4.2	328	RJD	
20140706	109	1	125	2	49.6	65	57.13	168	55.963	%	DL9	6.2	319	RJD	
20140706	119	1	126	1	48.3	65	56.092	168	56.289	%	DL8	6.7	330	RJD	
20140706	121	1	126	2	48.3	65	56.058	168	56.322	%	DL8	6.3	323	RJD	
20140706	130	1	127	1	47.6	65	55.132	168	56.327	%	DL7	5.8	330	RJD	
20140706	133	1	127	2	47.8	65	55.146	168	56.439	%	DL7	5.8	333	RJD	
20140706	142	1	128	1	47.6	65	54.15	168	56.327	%	DL6	6.7	332	RJD	

20140706	145	1	128	2	47.5	65	54.11	168	56.305	%	DL6	5.2	325	RJD	
20140706	153	1	129	1	46.8	65	53.195	168	56.25	%	DL5	6.2	325	RJD	
20140706	156	1	129	2	46.7	65	53.18	168	56.139	%	DL5	6.1	308	RJD	
20140706	205	1	130	1	44.5	65	52.252	168	56.27	%	DL4	6.6	323	RJD	
20140706	207	1	130	2	44.1	65	52.247	168	56.454	%	DL4	7.6	338	RJD	
20140706	216	1	131	1	46.7	65	51.241	168	56.293	%	DL3	4.7	333	RJD	
20140706	221	1	131	2	46.6	65	51.249	168	56.546	%	DL3	5.5	339	RJD	
20140706	230	1	132	1	46.3	65	50.336	168	56.298	%	DL2	4.5	303	RJD	
20140706	232	1	132	2	45.9	65	50.371	168	56.389	%	DL2	4.7	306	RJD	
20140706	243	1	133	1	45.7	65	49.368	168	56.29	%	DL1	6.3	313	RJD	
20140706	245	1	133	2	45.5	65	49.403	168	56.327	%	DL1	5.9	306	RJD	END OF DL line
20140706	301	1	134	1	43.4	65	49.273	168	52.309	%	DLa1	7.2	322	atn	Start of Dla Line
20140706	303	1	134	2	43.4	65	49.221	168	52.287	%	DLa1	7.7	325	atn	
20140706	313	1	135	1	45.3	65	50.255	168	52.089	%	DLa2	7.4	320	RJD	
20140706	315	1	135	2	46.3	65	50.317	168	51.884	%	DLa2	6.6	335	RJD	
20140706	323	1	136	1	47.5	65	51.226	168	52.19	%	DLa3	6.5	340	RJD	
20140706	325	1	136	2	47.5	65	51.296	168	52.256	%	DLa3	7	335	RJD	
20140706	333	1	137	1	48.1	65	52.194	168	52.144	%	DLa4	6.4	336	RJD	
20140706	335	1	137	2	48.1	65	52.22	168	51.999	%	DLa4	6.5	344	RJD	
20140706	344	1	138	1	48.2	65	53.136	168	52.103	%	DLa5	7.3	350	RJD	
20140706	346	1	138	2	46.8	65	53.13	168	51.975	%	DLa5	7.1	359	RJD	
20140706	356	1	139	1	48.3	65	54.12	168	52.216	%	DLa6	6.7	348	RJD	
20140706	358	1	139	2	48.1	65	54.154	168	52.081	%	DLa6	6.1	356	RJD	.hdr file mislabeled as DLa5, should be DLa6
20140706	408	1	140	1	49.3	65	55.161	168	52.29	%	DLa7	5.8	348	atn	
20140706	411	1	140	2	49.5	65	55.148	168	52.21	%	DLa7	3.2	3	atn	
20140706	420	1	141	1	50.4	65	56.089	168	52.205	%	DLa8	5.7	358	atn	
20140706	422	1	141	2	50.6	65	56.124	168	52.026	%	DLa8	5.7	6	atn	
20140706	431	1	142	1	50.3	65	57.114	168	52.227	%	DLa9	6.1	5	atn	
20140706	434	1	142	2	50.3	65	57.104	168	52.223	%	DLa9	6.1	14	atn	
20140706	442	1	143	1	50.6	65	58.011	168	52.233	%	DLa10	6.7	357	atn	
20140706	444	1	143	2	50.7	65	58.043	168	52.067	%	DLa10	5.9	8	atn	
20140706	455	1	144	1	50.8	65	59.047	168	52.226	%	DLa11	5.3	8	atn	
20140706	457	1	144	2	50.8	65	59.054	168	52.1	%	DLa11	5.7	14	atn	
20140706	511	1	145	1	51.3	65	59.966	168	52.199	%	DLa12	6.4	28	atn	
20140706	513	1	145	2	51.1	65	59.974	168	52.294	%	DLa12	4.6	12	atn	End of Dla Line
20140706	527	1	146	1	51.6	65	59.999	168	48.235	%	DLb12	6.1	356	atn	Start of DLb Line
20140706	530	1	146	2	51.6	66	0.042	168	48.203	%	DLb12	6.5	3	atn	
20140706	539	1	147	1	52.2	65	59.091	168	48.209	%	DLb11	7.5	348	atn	
20140706	542	1	147	2	51.9	65	59.019	168	48.311	%	DLb11	7.7	348	atn	
20140706	551	1	148	1	51.3	65	58.111	168	48.183	%	DLb10	9.5	345	atn	
20140706	553	1	148	2	51.4	65	58.118	168	48.287	%	DLb10	8.8	357	atn	
20140706	604	1	149	1	51.4	65	57.149	168	48.264	%	DLb9	9.2	352	atn	nice multi-layers, multiple mixed events?
20140706	606	1	149	2	51.4	65	57.159	168	48.399	%	DLb9	9.2	358	atn	
20140706	617	1	150	1	51.4	65	56.158	168	48.159	%	DLb8	8.2	351	atn	
20140706	619	1	150	2	51.4	65	56.166	168	48.295	%	DLb8	8.2	2	atn	
20140706	630	1	151	1	51.6	65	55.156	168	48.181	%	DLb7	7.1	3	atn	
20140706	632	1	151	2	51.7	65	55.124	168	48.353	%	DLb7	7.9	15	atn	
20140706	642	1	152	1	51	65	54.21	168	48.234	%	DLb6	9.7	3	atn	
20140706	644	1	152	2	51.1	65	54.244	168	48.394	%	DLb6	9.4	13	atn	
20140706	655	1	153	1	50.7	65	53.186	168	48.12	%	DLb5	9.5	18	atn	BIG signal of turbidity + fluoro at bottom
20140706	658	1	153	2	50.8	65	53.122	168	48.005	%	DLb5	9.3	11	atn	
20140706	706	1	154	1	50.2	65	52.249	168	48.244	%	DLb4	9.9	9	atn	interesting warm+saline layer at bottom
20140706	709	1	154	2	50	65	52.266	168	48.373	%	DLb4	9.2	17	atn	
20140706	719	1	155	1	49.1	65	51.285	168	48.191	%	DLb3	7	4	atn	
20140706	721	1	155	2	48.9	65	51.265	168	48.293	%	DLb3	8.6	4	atn	
20140706	733	1	156	1	48.9	65	50.303	168	48.203	%	DLb2	7.1	351	atn	
20140706	735	1	156	2	49.1	65	50.308	168	48.344	%	DLb2	8.8	0	atn	
20140706	746	1	157	1	48.7	65	49.335	168	48.234	%	DLb1	9.9	349	atn	

20140706	749	1	157	2	48.5	65	49.374	168	48.391	%	DLb1	8.6	6	atn	END OF DLb line
20140706	916	1	158	1	50.7	66	0.04	168	55.885	%	NBS1	9.4	17	atn	START OF NBS Line, E bound
20140706	918	1	158	2	50.5	66	0.083	168	55.914	%	NBS1	9.8	12	atn	
20140706	929	1	159	1	50.8	66	0.016	168	52.996	%	NBS1.5	10.1	357	atn	
20140706	932	1	159	2	50.8	66	0.056	168	52.834	%	NBS1.5	10.2	356	atn	
20140706	942	1	160	1	51.6	65	59.98	168	49.849	%	NBS2	9.8	356	atn	
20140706	945	1	160	2	51.7	66	0.01	168	49.692	%	NBS2	9.7	359	atn	
20140706	957	1	161	1	51.7	66	0.024	168	45.838	%	NBS2.5	9.8	0	atn	
20140706	1000	1	161	2	51.8	66	0.088	168	45.684	%	NBS2.5	10.3	3	atn	
20140706	1013	1	162	1	51.6	65	59.971	168	41.692	%	NBS3	9.1	356	atn	
20140706	1015	1	162	2	51.6	66	0.014	168	41.515	%	NBS3	9.7	350	atn	
20140706	1029	1	163	1	51.1	65	59.973	168	37.47	%	NBS3.5	9.3	5	atn	
20140706	1031	1	163	2	51.3	66	0.011	168	37.315	%	NBS3.5	9.3	359	atn	
20140706	1045	1	164	1	51.7	65	59.901	168	33.315	%	NBS4	10.9	357	atn	
20140706	1048	1	164	2	52	65	59.949	168	33.207	%	NBS4	9.5	352	atn	
20140706	1101	1	165	1	52	65	59.992	168	29.15	%	NBS4.5	11.6	354	atn	
20140706	1104	1	165	2	51.6	66	0.056	168	29.048	%	NBS4.5	10.2	351	atn	
20140706	1117	1	166	1	55.4	66	0	168	25.092	%	NBS5	11.8	352	atn	
20140706	1120	1	166	2	55.4	66	0.053	168	24.962	%	NBS5	11.3	348	atn	
20140706	1134	1	167	1	52.2	65	59.992	168	20.818	%	NBS5.5	10.6	353	atn	
20140706	1137	1	167	2	52.2	66	0.036	168	20.681	%	NBS5.5	10.6	350	atn	
20140706	1151	1	168	1	51.2	65	59.995	168	16.464	%	NBS6	10.5	0	atn	
20140706	1154	1	168	2	51.1	66	0.039	168	16.292	%	NBS6	11.5	357	atn	
20140706	1212	1	169	1	48.3	65	59.98	168	12.51	%	NBS6.5	10.5	356	ACPF	
20140706	1214	1	169	2	48.2	65	59.97	168	12.35	%	NBS6.5	11.9	344	ACPF	
20140706	1227	1	170	1	45.8	66	0	168	8.6	%	NBS7	8.1	6	ACPF	
20140706	1229	1	170	2	45.4	66	0.04	168	8.43	%	NBS7	10.1	0	ACPF	
20140706	1244	1	171	1	38.4	66	0	168	4.32	%	NBS7.5	10.5	1	ACPF	
20140706	1246	1	171	2	38.3	66	0.04	168	4.16	%	NBS7.5	10.7	359	ACPF	
20140706	1303	1	172	1	32	66	0.01	168	0.11	%	NBS8	12.2	17	ACPF	
20140706	1304	1	172	2	31.9	66	0	167	59.98	%	NBS8	11.9	30	ACPF	
20140706	1321	1	173	1	19.7	65	59.98	167	55.28	%	NBS9	12.8	13	ACPF	
20140706	1323	1	173	2	19.6	66	0.01	167	55.21	%	NBS9	12.1	13	ACPF	END OF NBS line
20140706	1623	1	174	1	46.8	65	52.08	168	55.88	%	MBSn1	14.8	350	ACPF	START OF MBSn line E bound
20140706	1625	1	174	2	46.8	65	52.07	168	55.86	%	MBSn1	13.6	355	ACPF	
20140706	1636	1	175	1	47.7	65	52.02	168	52.63	%	MBSn1.5	11.7	2	ACPF	
20140706	1638	1	175	2	47.7	65	52.07	168	52.58	%	MBSn1.5	13.9	12	ACPF	
20140706	1652	1	176	1	49.1	65	51.85	168	49.15	%	MBSn2	13.2	4	ACPF	
20140706	1654	1	176	2	49.1	65	51.86	168	49.11	%	MBSn2	13.7	0	ACPF	
20140706	1709	1	177	1	51	65	51.76	168	45.04	%	MBSn2.5	14.1	2	ACPF	
20140706	1711	1	177	2	51.2	65	51.8	168	45	%	MBSn2.5	14.9	4	ACPF	
20140706	1727	1	178	1	51.2	65	51.68	168	40.98	%	MBSn3	16	0	ACPF	
20140706	1730	1	178	2	51.2	65	51.7	168	40.96	%	MBSn3	17	353	ACPF	
20140706	1745	1	179	1	51.7	65	51.57	168	36.49	%	MBSn3.5	15.4	359	ACPF	
20140706	1747	1	179	2	51.7	65	51.6	168	36.43	%	MBSn3.5	15.8	356	ACPF	
20140706	1804	1	180	1	51.4	65	51.48	168	31.99	%	MBSn4	14.9	1	ACPF	
20140706	1806	1	180	2	51.4	65	51.51	168	31.92	%	MBSn4	12.9	355	ACPF	
20140706	1822	1	181	1	54	65	51.37	168	27.61	%	MBSn4.5	12.2	16	ACPF	
20140706	1825	1	181	2	54.3	65	51.41	168	27.55	%	MBSn4.5	14.1	17	ACPF	
20140706	1842	1	182	1	50.2	65	51.3	168	23.06	%	MBSn5	12.4	8	ACPF	
20140706	1844	1	182	2	50.2	65	51.34	168	23.01	%	MBSn5	13.6	0	ACPF	
20140706	1901	1	183	1	48.6	65	51.19	168	18.56	%	MBSn5.5	12.5	351	ACPF	
20140706	1903	1	183	2	48.3	65	51.22	168	18.49	%	MBSn5.5	14.6	354	ACPF	
20140706	1919	1	184	1	45	65	51.08	168	13.96	%	MBSn6	12.5	356	ACPF	
20140706	1921	1	184	2	44.8	65	51.12	168	13.9	%	MBSn6	16.9	354	ACPF	
20140706	1934	1	185	1	44	65	51.08	168	10.45	%	MBSn6.5	12.8	359	ACPF	
20140706	1936	1	185	2	44	65	51.11	168	10.4	%	MBSn6.5	12.3	2	ACPF	
20140706	1949	1	186	1	37.4	65	50.96	168	6.96	%	MBSn7	12.8	14	ACPF	

20140706	1951	1	186	2	37.5	65	50.98	168	6.93	%	MBSn7	14.5	18	ACPF	
20140706	2000	1	187	1	28.7	65	50.86	168	5.09	%	MBSn8	12	10	ACPF	
20140706	2002	1	187	2	28.9	65	50.88	168	5.06	%	MBSn8	13.5	20	ACPF	END OF MBSn line
20140706	2244	1	188	1	45.4	65	48.31	168	55.461	%	BS11	11.5	319	RJD	START OF BS line E bound
20140706	2247	1	188	2	45.1	65	48.304	168	55.35	%	BS11	10.9	320	RJD	
20140706	2255	1	189	1	46	65	47.814	168	53.817	%	BS11j	11.7	323	RJD	
20140706	2258	1	189	2	46.2	65	47.799	168	53.709	%	BS11j	12.2	326	RJD	
20140706	2307	1	190	1	42.7	65	47.267	168	51.67	%	BS12	12.2	321	RJD	
20140706	2309	1	190	2	42.9	65	47.295	168	51.606	%	BS12	13.3	318	RJD	
20140706	2318	1	191	1	47.5	65	46.854	168	49.714	%	BS12AJ	12.2	325	RJD	
20140706	2321	1	191	2	47.6	65	46.909	168	49.636	%	BS12AJ	12.4	320	RJD	
20140706	2331	1	192	1	50	65	46.365	168	47.656	%	BS13	14.4	329	RJD	
20140706	2333	1	192	2	50.1	65	46.389	168	47.6	%	BS13	15.7	328	RJD	
20140706	2344	1	193	1	49.1	65	45.858	168	45.547	%	BS13Z	13.5	338	RJD	
20140706	2346	1	193	2	50.2	65	45.872	168	45.565	%	BS13Z	15.3	351	RJD	
20140706	2357	1	194	1	51.3	65	45.295	168	43.245	%	BS14	17.1	332	RJD	
20140706	2359	1	194	2	51.1	65	45.304	168	43.182	%	BS14	17.2	330	RJD	
20140707	8	1	195	1	50.3	65	44.829	168	41.564	%	BS14J	18	336	RJD	
20140707	10	1	195	2	50.3	65	44.835	168	41.486	%	BS14J	18.4	337	RJD	
20140707	18	1	196	1	50.2	65	44.356	168	39.824	%	BS15	17.5	341	RJD	
20140707	21	1	196	2	50.1	65	44.364	168	39.753	%	BS15	15.1	336	RJD	
20140707	31	1	197	1	50.2	65	43.836	168	37.64	%	BS15J	14.9	337	RJD	
20140707	33	1	197	2	50.2	65	43.853	168	37.572	%	BS15J	16.9	336	RJD	
20140707	43	1	198	1	49.9	65	43.276	168	35.492	%	BS16	16.8	340	RJD	
20140707	46	1	198	2	49.9	65	43.276	168	35.456	%	BS16	16.9	340	RJD	
20140707	55	1	199	1	50.3	65	42.768	168	33.388	%	BS16J	17.2	330	RJD	
20140707	58	1	199	2	50.4	65	42.784	168	33.329	%	BS16J	16.3	340	RJD	
20140707	107	1	200	1	53.7	65	42.241	168	31.325	%	BS17	11.7	350	RJD	
20140707	110	1	200	2	53.5	65	42.276	168	31.2	%	BS17	13.8	342	RJD	
20140707	120	1	201	1	51.9	65	41.716	168	29.234	%	BS17S	14.2	352	RJD	
20140707	122	1	201	2	51.9	65	41.751	168	29.132	%	BS17S	15.3	347	RJD	
20140707	132	1	202	1	52.3	65	41.192	168	26.962	%	BS18	14.2	353	RJD	
20140707	135	1	202	2	52.5	65	41.213	168	26.922	%	BS18	13.8	350	RJD	
20140707	144	1	203	1	51	65	40.802	168	25.243	%	BS18J	12.6	348	RJD	
20140707	147	1	203	2	51.3	65	40.833	168	25.203	%	BS18J	13.6	350	RJD	
20140707	156	1	204	1	50.2	65	40.366	168	23.485	%	BS19	14.5	354	RJD	
20140707	158	1	204	2	50.2	65	40.396	168	23.448	%	BS19	14.6	356	RJD	
20140707	209	1	205	1	48.9	65	39.862	168	21.296	%	BS19H	11.3	359	RJD	
20140707	212	1	205	2	49.1	65	39.914	168	21.264	%	BS19H	13.1	350	RJD	
20140707	224	1	206	1	47.1	65	39.339	168	19.06	%	BS20	13.2	352	RJD	
20140707	226	1	206	2	47.1	65	39.382	168	19.036	%	BS20	13.7	352	RJD	
20140707	237	1	207	1	44.6	65	38.938	168	17.061	%	BS20J	13.4	353	RJD	
20140707	239	1	207	2	44.8	65	38.977	168	17.071	%	BS20J	13.6	348	RJD	
20140707	249	1	208	1	40.7	65	38.551	168	15.04	%	BS21	12.2	357	RJD	
20140707	251	1	208	2	40.7	65	38.587	168	15.05	%	BS21	13.7	350	RJD	
20140707	304	1	209	1	37.5	65	38.044	168	13.003	%	BS21A	13.4	6	atn	
20140707	306	1	209	2	37.6	65	38.077	168	13.025	%	BS21A	12.5	1	atn	
20140707	319	1	210	1	30.5	65	37.502	168	10.779	%	BS22	12.4	7	atn	
20140707	321	1	210	2	30.5	65	37.536	168	10.791	%	BS22	11.8	7	atn	
20140707	338	1	211	1	29.1	65	35.994	168	9.785	%	BS23	16.5	34	RJD	
20140707	340	1	211	2	29.3	65	36.023	168	9.85	%	BS23	14.6	30	RJD	
20140707	400	1	212	1	25	65	34.934	168	7.164	%	BS24	24.1	13	RJD	This is the same as SBS1
20140707	402	1	212	2	26.8	65	34.939	168	7.26	%	BS24	22.7	18	RJD	END of line BS
20140707	421	1	213	1	37	65	33.953	168	11.996	%	SBS2	19.5	22	atn	BEGIN of line SBS
20140707	423	1	213	2	37	65	33.96	168	11.974	%	SBS2	19.3	8	atn	
20140707	443	1	214	1	42.6	65	32.962	168	16.765	%	SBS3	18.2	9	atn	
20140707	445	1	214	2	42.8	65	32.968	168	16.767	%	SBS3	17.7	356	atn	
20140707	506	1	215	1	47	65	31.981	168	21.555	%	SBS4	19.1	4	atn	

20140707	508	1	215	2	47	65	31.985	168	21.531	%	SBS4	19.7	348	atn	
20140707	528	1	216	1	58.1	65	31.007	168	26.391	%	SBS5	18.9	11	atn	
20140707	531	1	216	2	58	65	31.011	168	26.391	%	SBS5	18.2	359	atn	
20140707	550	1	217	1	59.3	65	30.002	168	31.27	%	SBS6	17	8	atn	
20140707	553	1	217	2	59.3	65	29.986	168	31.22	%	SBS6	18.2	355	atn	
20140707	612	1	218	1	54.8	65	29.041	168	36.113	%	SBS7	18.5	4	atn	
20140707	615	1	218	2	54.9	65	29.037	168	36.112	%	SBS7	17.9	352	atn	
20140707	636	1	219	1	55.2	65	28.047	168	40.999	%	SBS8	18.8	352	atn	
20140707	638	1	219	2	55.1	65	28.025	168	41.106	%	SBS8	17.2	5	atn	STOP here