Línea de acción 5

Análisis de escenarios de derrames

Procesamiento de datos de CTD, termosalinómetro y ADCPs

Reporte de datos

Experimento de Dispersión en Aguas Profundas

(DWDE-1)

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1 INTRODUCTION

This study is part of the megaproject "Ocean observation platforms, base line, numerical modeling and scenarios of natural response capability of the Gulf of Mexico, under potential large scale oil spills", conducted by the Consorcio de Investigación del Golfo de México (CIGoM), and funded by Fondo Sectorial SENER-CONACyT-Hidrocarburos. The overall goals of the megaproject include: improve the predictability of pollutant transport; obtain a baseline of biological, ecological and biogeochemical parameters; and establish possible consequences of large scale oil spill scenarios in the deep waters of the Gulf of Mexico.

The large megaproject is subdivided in several subprojects, and the activities of the cruise reported here are part of the Deep Water Dispersion Experiment (DWDE), which is the observational program of the subproject "Deep and shallow particle dispersion and biological connectivity over the continental slope in the western Gulf of Mexico", the goals of which are:

- Provide new information on the most important transport mechanisms of pollutants released in the deep waters of the Perdido region.
- Provide a dataset to assess the accuracy of numerical model predictions and improve the parameterizations of submesoscale features in ocean models for deep water regions of the Gulf of Mexico.
- Develop a solid understanding of background levels of hydrocarbon fluorescence as well as carbon sources in the deep water regions of the Gulf of Mexico.
- Integrate biological connectivity estimations with model predictions to increase our understanding of the influence of mesoscale features on pelagic populations.

This report summarizes the data processing of the ship data obtained during DWDE-1.

2 Stations

DWDE1 campaign consisted of 17 stations where biological, chemical and physical samples were collected in the region of Perdido (western Gulf of Mexico), Figure 1: Stations DWDE1Figure 1.

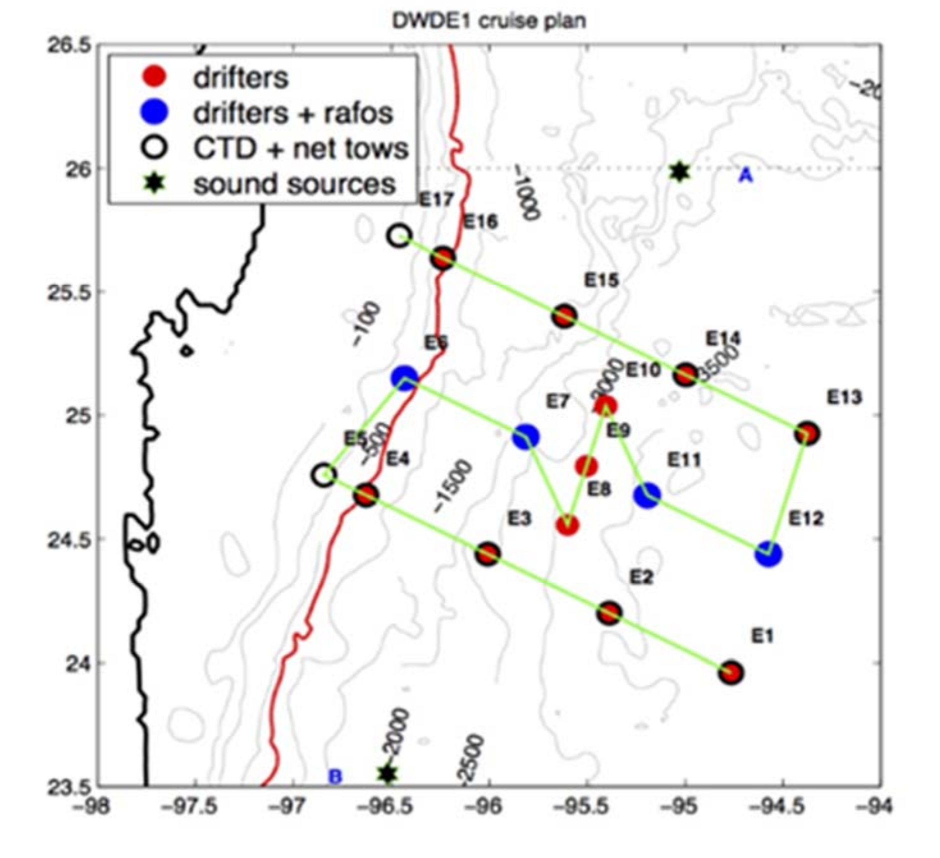

Figure 1: Stations DWDE1

The surface circulation patterns and ship trajectory are shown in Figure 2. Particularly of interest are the anticyclone/cyclone pair found in the western Gulf of Mexico, between 23 and 27 N. This dipole was measured by the three ship mounted ADCPs and with the CTD casts.

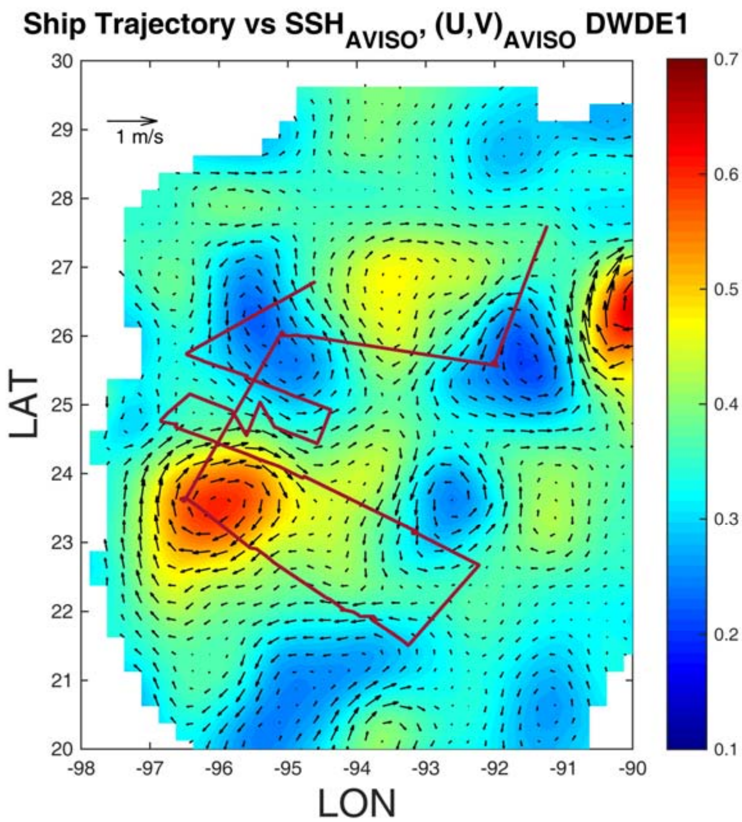

Figure 2. Sea surface circulation pattern on June 20 and ship path. The map shows anticyclone/cyclone pair in the Perdido region, and several other mesoscale structures in the Gulf of Mexico.

3 DESCRIPTION OF DATA

3.1 General

This report describes the data acquired during the DWDE1 cruise in the region of Perdido in the Gulf of Mexico from 15 to 26 of June, 2016, on board the R/V Pelican. A total of 10 CTD casts were collected in two cross-shelf transects: north (E13-E17) and south (E1-E5 stations), see Figure 1.

3.1.1 CTD instrument

The CTD instrument used during this cruise was an SBE-911 plus, made by Sea-bird Electronics Inc.

The CTD was equipped with the standard sensors: temperature, conductivity (salinity), pressure (depth) and oxygen. In addition, backscatter fluorometers were installed to determine the distribution of hydrocarbons and natural chromophoric dissolved organic matter (CDOM). One was a WetLabs CDOM sensor with an excitation/emission setting of 370nm/460n m, the second sensor was a Chelsea Technologies hydrocarbon sensor with an excitation/emission setting of 239nm/360nm. The CTD was also equipped with an oxygen sensor. These sensors were deployed at all hydrographic stations. Specifications for the CTD sensors are given in Table 1

Table 1: CTD sensor specifications and calibration dates.

PARAMETERS AND SENSORS	RANGE	ACCURACY	RESOLUTION (at 24 Hz)	CALIB. DATE
Conductivity: SBE04 (x2)	0-70 Sm-1	0.003 Sm-1	0.0004Sm-1	4/12/2016
Pressure: Paroscientifi Digiquartz	0-10350 dbar	0.015% of full scale	0.001% of full scale	1/25/2016
Temperature: SBE03 (x2)	-5.0 - +35 °C	± 0.001 °C	0.0003 °C	4/12/2016

Oxygen: SBE43 (x2)	120% of surface saturation	± 2% of saturation	N/A	2/9/2016
Colored Dissolved Organic Matter: Fluorometer Wet Labs CDOM	Chl-a: 0.03-75 µg/L, Uranine: 0.03-75 µg/L	N/A	Chl-a: 0.03 µg/L, Uranine: 1 µg/l	5/22/2007
Hydrocarbons: Fluorometer Chelsea UV Aquatracka	Chl-a: 0.01-100 µg/L, Rhodamine: 0.01-100 µg/L, Fluorescein: 0.01-100 µg/L, Turbidity: 0.01-100 FTU	± 0.02 µg/l or 3% whichever the greater	Chl-a: 0.01 µg/L, Rhodamine: 0.01 µg/L, Fluorescein: 0.01 µg/L, Turbidity: 0.01 FTU	12/1/2015
Beam Transmission: transmissiometer Wetlabs C-Star	0-100%	N/A	N/A	8/3/2016

3.1.2 Thermosalinograph

In addition, surface data was continuously collected along track by the ship's Sea-bird Electronics SBE 21 thermosalinograph, a Wetstar Fluorometer and a WETLabs CStar 25.0-centimeter path length transmissometer

The data collected were: temperature, salinity, chlorophyll-a, and beam transmission. Specifications of the sensors are given in Table 2.

Table 2: Thermosalinograph sensor specifications and calibration dates.

PARAMETERS AND SENSORS	RANGE	ACCURACY	RESOLUTION (at 24 Hz)	CALIB. DATE
Conductivity	0 - 7 Sm-1	± 0.001 S/m	0.0001 S/m	N/A
Temperature	-5 to +35 °C	± 0.01 °C	0.001 °C	N/A
Temperature, SBE 38 remote	-5 to +35 °C	± 0.001 °C	0.0003 °C	N/A
Chlorophyll-a	0.03-75 µg/L		0.03 µg/L	N/A
Beam Transmission: transmissometer Wetlabs C-Star	0-100%	N/A	N/A	2/12/2015 field calibration: 06-14-2016

3.1.3 ADCPs

R/V Pelican have three Acoustic Doppler Current Profilers (1200 kHz, 300 kHz and 75 kHz RDI).

To resolve the surface with high detail it uses an ADCP Workhorse 1200 Khz. The instrument is configured with a vertical resolution (bin size) of 0.5m and time resolution of two minutes. Depending on the operation conditions the maximum range achieved is about 12m. The first measured bin is at 5m depth giving us information down to 17 meters.

A Workhorse 300KHz ADCP was configured with a vertical resolution of 2 meters and a time resolution of 2 minutes. The maximum range achieved during the measurement campaign was 70 m. The blanking distance for this instrument was approximately 9 m, thus the instrument measured correctly up to 80m.

Finally, to measure large depths an Ocean Surveyor 75 Khz was used. This instrument was configured with a bin size of 16m and time resolution of 5 minutes. The maximum achieved range was approximately 770 m, considering a blanking distance of 27 m, in good conditions, the instrument measured up to 790 m.

The range that the instruments measure depends on multiple factors: the instrument characteristics, the navigation and the weather conditions. Measurements under low-wind (small-waves) conditions are the best.

Around the 19th of June a Tropical Storm was forming in front of Veracruz State, the ship was headed toward East, a period of high waves reached the ship. The result was the loss of data (June 19th to June 20th) due to the ship erratic movement, see **Error! Reference source not found.**. The gap is also visible in the WH1200KHz and WH300KHz (not show here).

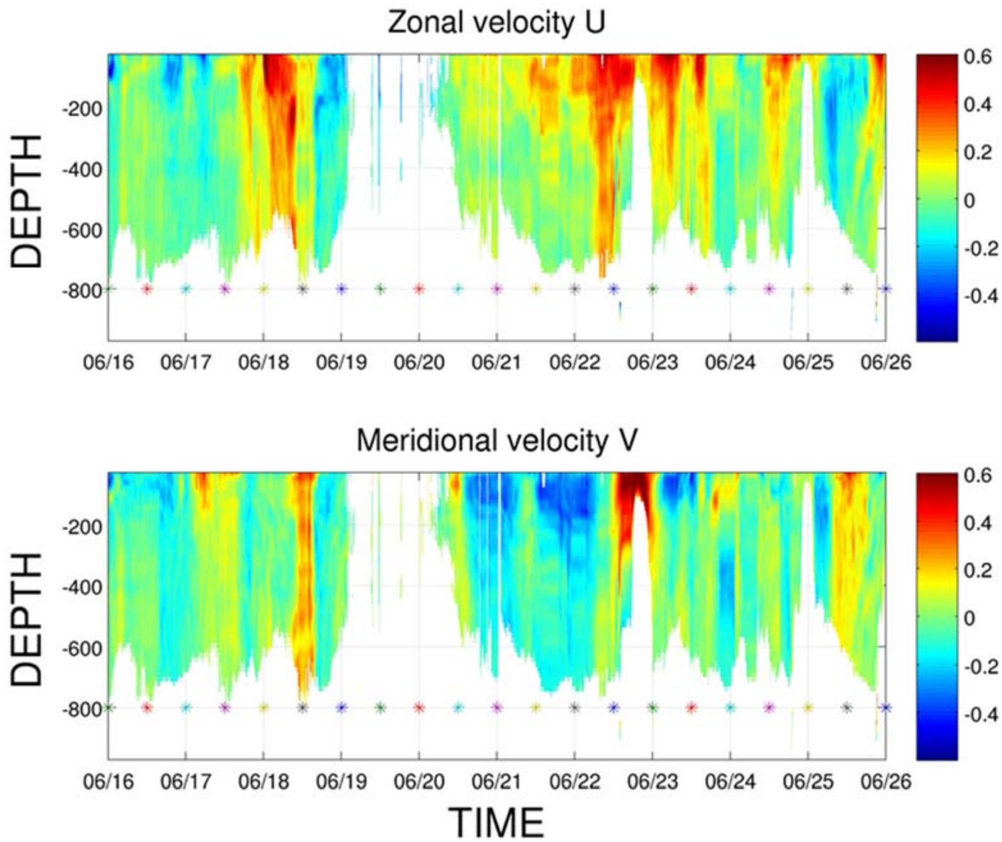

Figure 3: Zonal and Longitudinal velocities measured by the 75 kHz ADCP during the DWDE1 cruise. The gap between 19 and 20th June was caused by bad weather during the cruise.

4 DATA PROCESSING

4.1 CTD

The CTD data processing consisted of two stages: Seabird: Seasave and Data Processing modules and Python CTD library.

4.1.1 Seabird processing

The first part of the processing of CTD data was done using Seabird software Version 7.25.0.319.

1. First step in this stage was to convert data from its original hexadecimal values (frequency and voltage) to ascii values (from HEX to CNV files), during this stage a hysteresis correction was applied to the Oxygen values. The conversion process was performed using the Seasave program from Seabird.

The extracted variables and their units are presented in Table 3:

Table 3: CTD variables DWDE1 campaign.

VAR. NAME	VARIABLE MEASURED	UNITS
prDM	Pressure, Digiquartz	Db
Pumps	Pump Status	on(1)/off(0)
t090C	Temperature (ITS-90)	ºC
t190C	Temperature, 2 (ITS-90)	ºC
timeS	Time, Elapsed	Seconds
Spar	SPAR/Surface Irradiance	
sal00	Salinity, Practical	PSU
sal11	Salinity, Practical, 2	PSU
sbeox0ML/L	Oxygen, SBE 43	ml/l
sbeox1ML/L	Oxygen, SBE 43, 2	ml/l
wetCDOM	Fluorescence, WET Labs CDOM	mg/m^3
flCUVA	Fluorescence, Chelsea UV Aquatracka	ug/l
CStarTr0	Beam Transmission, WET Labs C-Star	%
depSM	Depth (salt water)	M
dz/dtM	Descent Rate	m/s
Latitude	Latitude	Deg
Longitude	Longitude	Deg

Scan	Scan Count	Count
altM	Altimeter	M
timeJ	Julian Days	Days
c0S/m	Conductivity	S/m
c1S/m	Conductivity, 2	S/m
sbeox0Mm/Kg	Oxygen, SBE 43	µmol/kg

2. Following the extraction of the variable, the **Wildedit** module was used. This module eliminates bad data: large values and values flagged as “bad” are eliminated from the data series. To discard bad data, the module calculates the mean 100 data points (corresponding to about 5 seconds of sampling) and eliminates those values where data deviates by more than 2 standard deviations. And the process is repeated with the new ensemble, and data deviating more than 20 standard deviations are flagged as bad.

3. The module **Filter** is used to low-pass filter the salinity and pressure with constants A=0.03 and B=0.15 seconds, respectively.

4. Next step in the processing is aligning the oxygen and conductivity data, two seconds and 0.73 seconds are applied respectively to oxygen and conductivity and salinity. This alignment is applied using the **align CTD** module.

5. The last stage of the Seabird processing is to apply **Celltm** module. This step apply cell thermal mass correction for the lag in the response of temperature sensor.

Finally, data is then saved as ascii CNV files.

4.1.2 Python CTD processing

The second part of the processing of the CTD data was performed using the Python CTD library (https://github.com/ocefpaf/python-ctd). A tool to load hydrographic data into Pandas DataFrame. This library includes some methods for data pre-processing and analysis.

In this stage a six-steps processing was performed:

1. First a moving average with a time window of 2 seconds is applied to descent velocity and oxygen values. This filter is applied to remove the noise of the high frequency signals. The descent velocity will be used to remove pressure reversals later on.

2. Remaining bad values are eliminated from the wetCDOM, flCUVA and Cstar sensors. In some occasions the lack of synchronization between sensors and the data acquisition system results in wrong recorded values. This values can be detected as jumps in the data that have a fixed value (e.g. 0). This values were not removed by the Wild Edit module. This step is important to avoid the generation of artificial peaks in the processed data.

3. Pressure reversals are the eliminated from the dataset using a threshold velocity of 0.25 m/s. The pressure reversals arise from the ship heave. This method is equivalent to **Loop Edit** module of Sea-bird.

4. A despiking process is applied to all series to eliminate remaining bad values. The despike process is equivalent to Wildedit from Seabird.

5. Splitting on downcast and upcast is performed. This step consist of separating the data from down and up components if the casts. Usually the downcast is the data that is used to analyze due to the fact that instruments are measuring undisturbed parcels of water.

6. Data is saved as CSV files ready to be used.

The data were inspected visually for each cast, comparing upcast and downcasts, as well as the primary and secondary sensors, after which final editing of the data were made.

The final data result from the processed data collected by the primary sensors during the downcast. The positions for each cast were obtained by averaging the ships' GPS data over the duration of the CTD downcast.

4.2 ADCPs

The ADCP data were collected and pre-processed by the python UHDAS-CODAS system implemented by the University of Hawaii, which automatically and continuously graphed the data in near-real time.

UHDAS (University of Hawaii Data Acquisition System) is an open source acquisition software, this is responsible for acquiring the three ADCPs and other instrument's data required for the processing. UHDAS is capable to acquire information from several ADCPs using only one computer, this is an advantage compared with the VmDAS system (Teledyne RD Instruments) which needs one computer per ADCP.

The **CODAS processing** (Common Ocean Data Access System) processing system is a Python and C suite of programs specially designed to process and store ADCP data. CODAS processing system uses data from ADCPs, GPS and navigation system to extract velocities of the flow relative to the ship.

In general, four steps are needed to process ADCP data:

1. A reference layer is used to remove the ship's speed from the velocities measured by the ADCPs. By assuming the oceans reference layer is smooth, positions can be nudged to smooth the ship's velocity, which directly results in a smooth reference layer.

2. GPS heading correction of the gyro heading, using a quality-controlled difference in headings. A GPS-derived heading source may provide a more accurate (but less reliable) heading source than the gyro.

3. Estimation of the heading misalignment from either “bottom track “ or “water track”. Watertrack calibration use sudden accelerations (such as stopping and starting of the ship when doing station-work) to derive an estimate if the heading misalignment.

4. Edition of the database to remove bad data.

CODAS processing is managed by the Python program quick_adcp.py. The actual steps for processing the ADCP data with the CODAS processing software are the following:

1. Setting up a processing directory (**adcptree.py**)

2. Scanning the data files in order to determine whether there are issues with timestamps that need to be addressed. Two operations are performed in during this stage:
   - List time ranges and other information about the data files
   - Create a file with the time range of the data

3. Load data into CODAS database. This is achieved by calling quick_adcp.py with a control file with parameters for processing. When working with

UHDAS the program handles single-ping data and performs the following actions:

1. Read the ADCP and ancillary serial data
2. Find the UTC time, position and attitude
3. Edit out bad single-ping velocities
4. Average the single ping data
5. Write to disk

4. Heading correction: obtain a heading correction for the gyro heading, using the GPS-based attitude device and check the health of the accurate heading device.

5. Navigation: find and smooth the reference layer

6. Calibration: determine preliminary angle and amplitude calibrations from watertrack and/or bottom track data (using corrected headings)

7. Editing: bottom interference, wire interference, bubbles, ringing, identifying problems with heading and underway bias. This includes the use of gautoedit manual processing.

8. Calibration: final calibration using edited data.

9. Documentation: record the different steps during the processing of the data.

10. Extraction: netcdf or matlab files.

4.3 Thermosalinograph

Data from thermosalinograph was extracted from MIDAS dataset. Due to the different time resolutions for the navigation and thermosalinograph a process to merge the data was needed.

The MIDAS system collects atmospheric and sea surface data, but only Temperature, Salinity and Fluorescence were extracted.

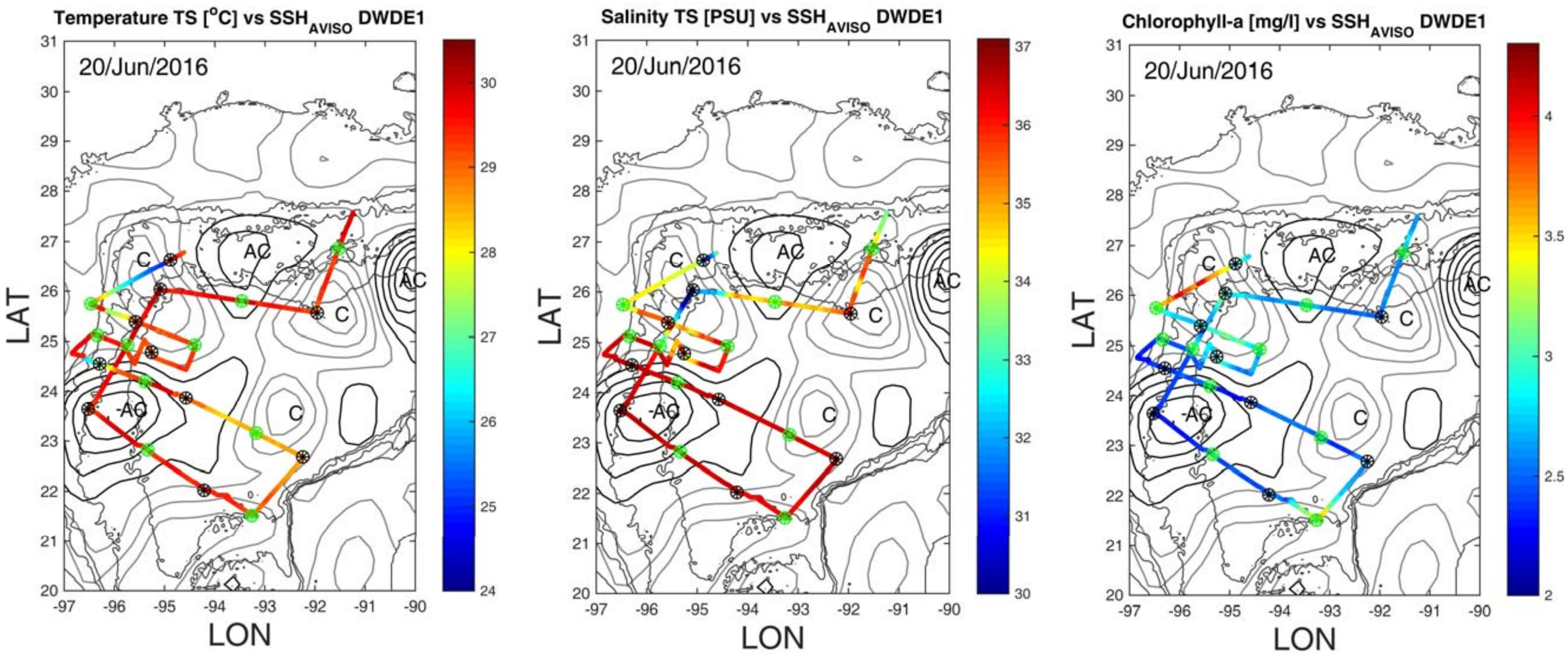

Figure 4: Temperature, Salinity and Chlorophyll-a measured along ship path during DWDE1 cruise.

5 CTD casts transects

The transect casts were collected along 2 cross-shelf sections: south and north. Each consisting of five casts.

The information about the CTD casts is given in Table 4. The depths corresponds to maximum depth reached in the cast, not to the planed depth. The latitudes and longitudes where calculated as the mean value of the cast positions recorded by the GPS.

Table 4: CTD cast's information for DWDE1 cruise.

DAY	SECTION	STATION	CAST #	DEPTH (m)	Lat	Long
21/06/2016	South	E1	1	3653	23° 56.9861 N	95° 15.9147 W
22/06/2016	South	E2	2	3396	24° 11.5287 N	96° 38.4108 W
22/06/2016	South	E3	3	1503	24° 25.3047 N	96° 03.3223 W
22/06/2016	South	E4	4	672	24° 38.1788 N	97° 31.6603 W
22/06/2016	South	E5	5	146	24° 35.0387 N	97° 50.3396 W
24/06/2016	North	E13	6	3661	24° 55.1976 N	95° 38.8734 W

24/06/2016	North	E14	7	3501	25° 09.3152 N	95° 01.7738 W
24/06/2016	North	E15	8	1430	25° 22.9746 N	96° 26.9730 W
24/06/2016	North	E16	9	591	25° 35.6091 N	97° 55.5282 W
24/06/2016	North	E17	10	90	25° 26.7165 N	96° 35.9308 W

From now results will be presented using the new **International Thermodynamic Equation Of Seawater – 2010 (TEOS-10) [1]**. A thermodynamic description of sea water based on Gibbs function, in this formulation of thermodynamic properties are calculated directly and are fully consistent.

First, as an alternative to the T-S diagram, the diagram of Absolute Salinity vs Conservative Temperature is shown in Figure 5. The figure also shows iso-contours of density and spiciness. The plot also shows dissolved oxygen (in color), which shows deep waters (d>1000 m) have large content of it.

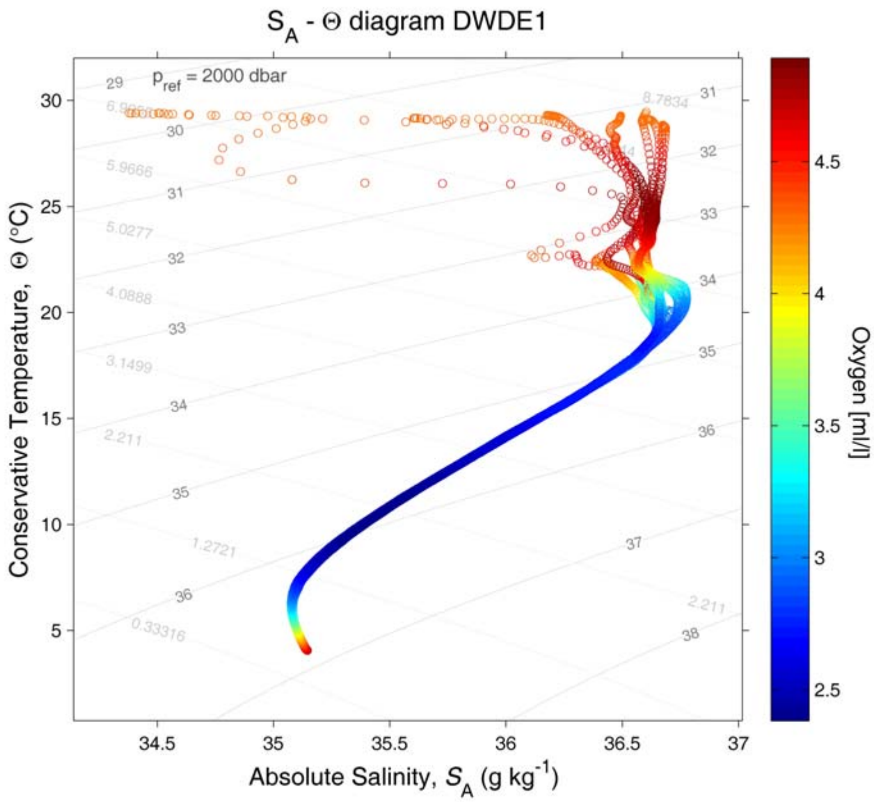

Figure 5: Absolute Salinity vs Conservative temperature diagram for downcast data DWDE1 σ_t contours are shown every 1.0 kg/m^3 and π (spiciness) contours every 0.94 kg/m^3.

5.1 Section South

Cross-shelf section plots of In Conservative Temperature, Absolute Salinity, Oxygen, Beam Transmissivity, Brunt-Vaisala frequency, CDOM and CUVA are shown from Figure 6 to Figure 12.

Figure 6 shows the 29 ^{o}C isotherm reaching the surface and the 21 ^{o}C isotherm deepened, a fact that could signal the presence of an anticyclonic eddy.

Also in the same figure it can be seen that the 21 ^{o}C isotherm is moved upwards, signaling the presence of surgence, possibly due to the presence of a cyclonic circulation.

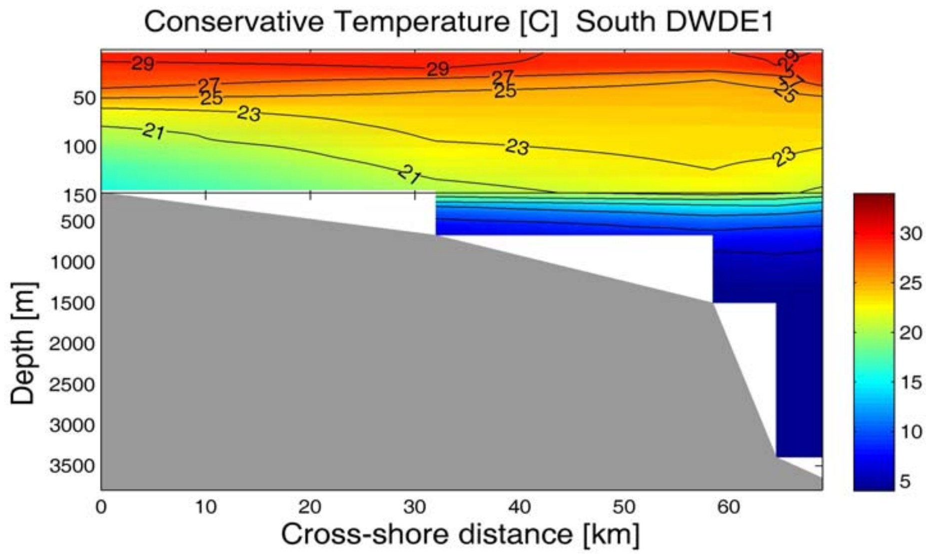

Figure 6: Conservative Temperature section South DWDE1. TC contours are plotted every 2 °C

In TEOS-10, Absolute Salinity (SA) is preferred over Practical Salinity due to the fact that SA is the appropriate salinity variable for the accurate calculation of horizontal density gradients in the ocean and it is also the appropriate salinity variable for the calculation of freshwater fluxes and for calculations involving the exchange of freshwater with the atmosphere and with ice.

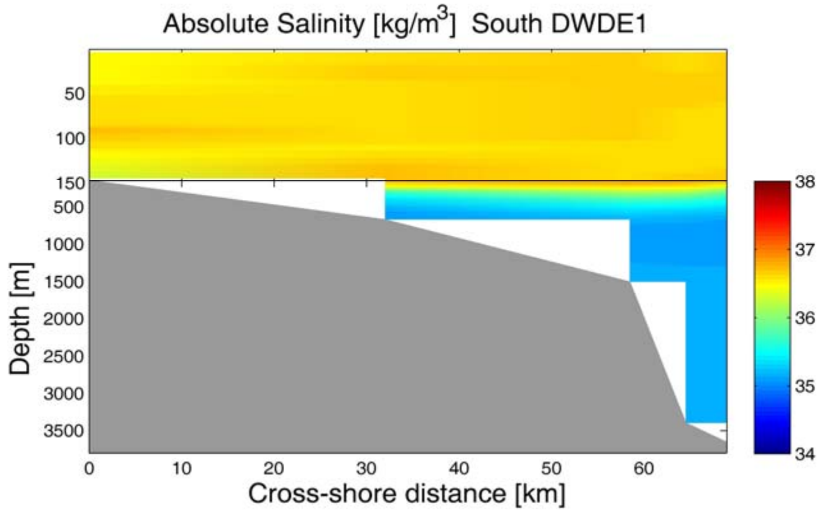

Figure 7: Absolute Salinity section South DWDE1 cruise.

Figure 8 shows a subsurface minimum in the oxygen (O<.3 ml/l) between 100 and 150 meters close to the shelf and between 500 and 150 m in the deeper part of the section, and larger values (O>0.4 ml/l) below 1000 m.   The position of the minimum of oxygen close to the shelf is consistent with the presence of a cyclonic circulation.

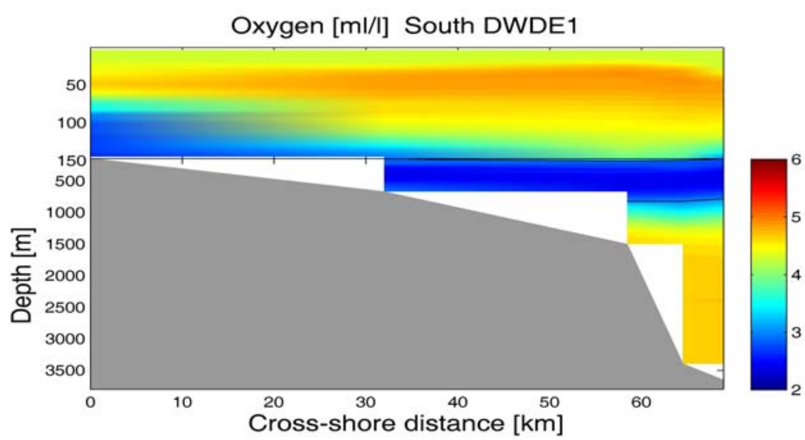

Figure 8: Oxygen section South DWDE1 cruise.

Figure 9 shows a subsurface region with low transmissivity region between 50 and 100m deep. This region also coincides with a low oxygen region (O~3.5ml/l), this might be related with the presence large concentrations of organic matter.

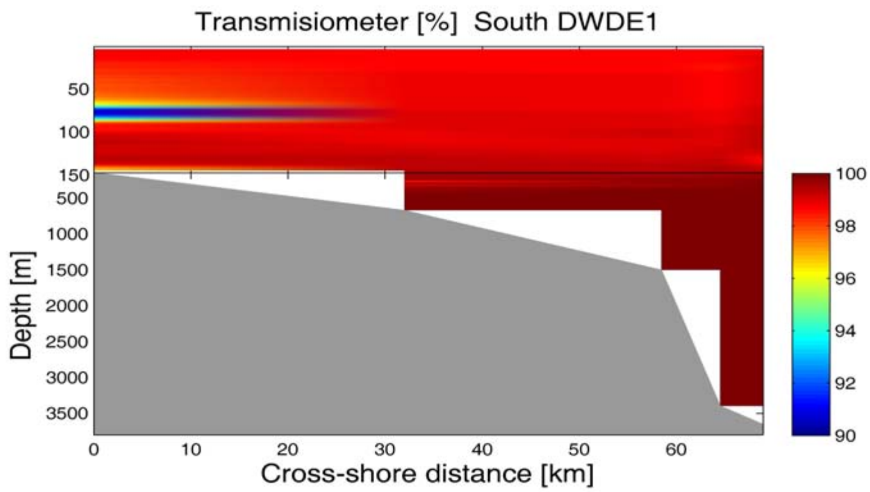

Figure 9: Beam transmission section South DWDE1.

Close to the shelf, a region of large Brunt-Vaisala frequency is located about 50m deep (Figure 10), just above the region of low transmissivity. This region might be related with the position of the picnocline.

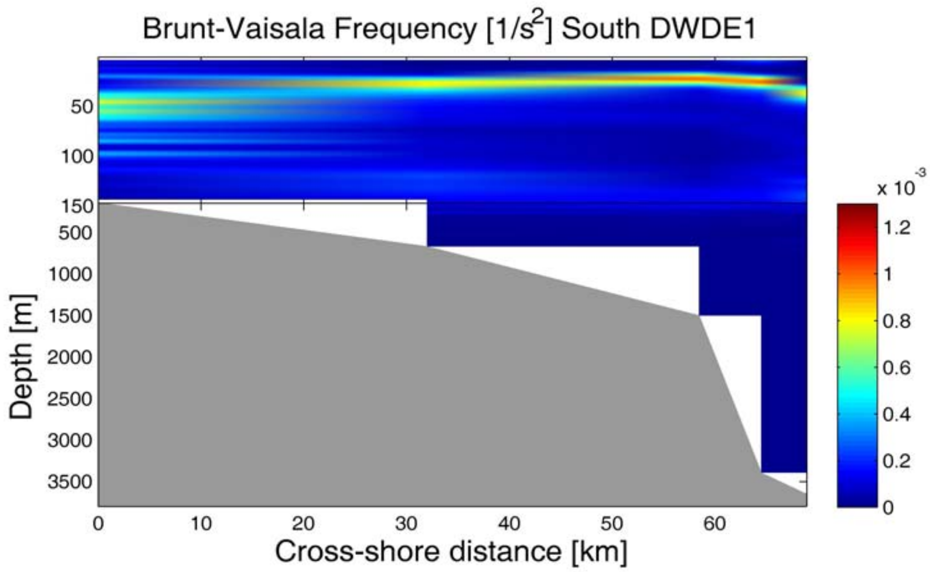

Figure 10: Brunt-Vaisala Frequency section South DWDE11.

The CDOM section in Figure 11 shows large values (>4 mg/m^3) below 1000 m, but also show a region of high values (~3.8 mg/m^3) in the same region of low transmissivity close to the shelf.

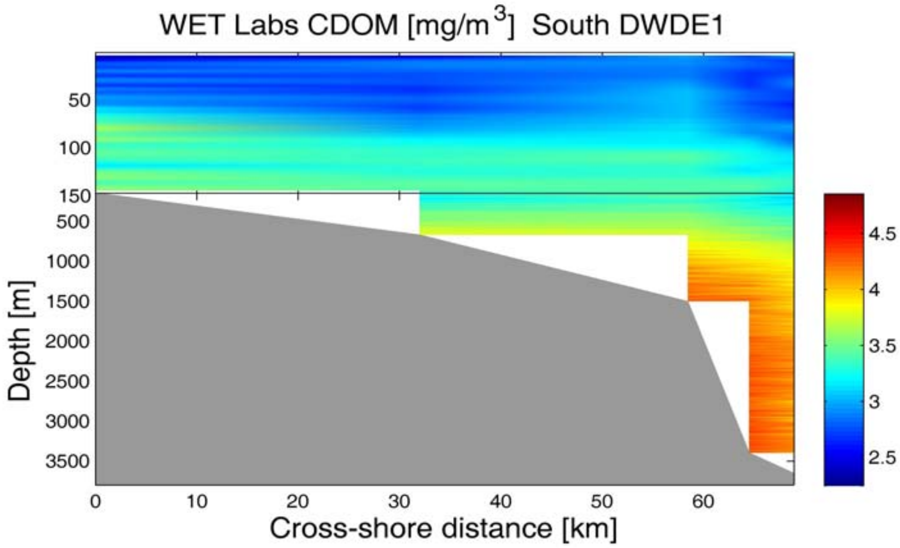

Figure 11: Colored Dissolved Organic Matter section South DWDE1.

Close to the shelf, the Chlorophyl-a Chelsea UV in Figure 12 shows a region of high fluorescence values (~0.3 µg/l) near the surface but more interesting is the region below 50 the region of high Brunt-Vaisala frequency, where Chelsea UV fluorometer gives large values (0.25 µg/l) in the measured Chlorophyll-a . The position coincides with the region of low beam transmission, signaling the presence large amounts of organic matter.

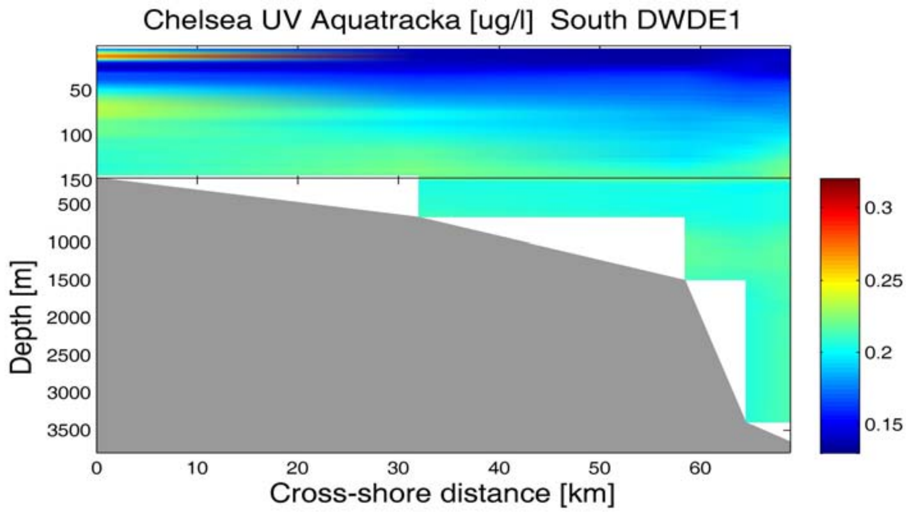

Figure 12: Chlorophyl-a Chelsea UV Aquatracka section South DWDE1.

6 REFERENCIAS Y AGRADECIMIENTOS

[1] IOC, SCOR and IAPSO, 2010: *The international thermodynamic equation of seawater – 2010: Calculation and use of thermodynamic properties*. Intergovernmental Oceanographic Commission, Manuals and Guides No. 56, UNESCO (English), 196 pp.

[2]**UHDAS+CODAS** 2015.05.01-python documentation, http://currents.soest.hawaii.edu/docs/doc/index.html, accessed 20-Nov-2016

[3] **Python CTD ver. 0.2.1**: *Tools to load hydrographic data as DataFrames,* https://github.com/ocefpaf/python-ctd, *accessed 15-Nov-2016*

[4] **Seasoft V2: SBE Data Processing CTD Data Processing & Plotting Software for Windows** manual. Ver. 7.25.0

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7 Appendix

7.1 APPENDIX A. Scientific Crew

Scientific crew DWDE1

Name	Institution
Dra. Paula Pérez Brunius*	CICESE
Brian J. Guest	WHOI
Sharon Herzka	CICESE
Rainer M. W. Amon	TAMUG
Paula García Carrillo	CICESE
Argelia Ronquillo Méndez	CICESE
Alejandro Domínguez Guadarrama	CICESE
Mónica Cecilia Mozqueda Torres	CICESE
Doris Piñero Lajas	CICESE
Rodrigo Ávalos	CICESE
Concepción Curiel Mondragón	CICESE
Tatiana Molodtsova	TAMUG
*** Chief Scientist**	

7.2 APPENDIX B. CTD calibration sheets

PSA file: D:\CTD Data\2016\PE16_25_Bower_CTD\PE16_25_Bower.psa

Date: 06/24/2016

Instrument configuration file:

D:\CTD Data\2016\PE16_25_Bower_CTD\PE16_25_Bower.xmlcon

Configuration report for SBE 911plus/917plus CTD

Frequency channels suppressed : 0

Voltage words suppressed : 0

Computer interface : RS-232C

Deck unit : SBE11plus Firmware Version < 5.0

Scans to average : 1

NMEA position data added : Yes

NMEA depth data added : No

NMEA time added : No

NMEA device connected to : deck unit

Surface PAR voltage added : Yes

Scan time added : No

1) Frequency 0, Temperature

Serial number : 1811

Calibrated on : 26-Jan-16

G : 4.85180575e-003

H : 6.74785281e-004

I : 2.61413902e-005

J : 2.05656066e-006

F0 : 1000.000

Slope : 1.00000000

Offset : 0.0000

2) Frequency 1, Conductivity

Serial number : 3044

Calibrated on : 28-Jan-16

G : -9.82255596e+000

H : 1.39012679e+000

I : 2.60096161e-004

J : 5.95011105e-005

CTcor : 3.2500e-006

CPcor : -9.57000000e-008

Slope : 1.00000000

Offset : 0.00000

3) Frequency 2, Pressure, Digiquartz with TC

Serial number : 0461

Calibrated on : 25-Jan-16

C1 : -4.244351e+004

C2 : 4.166578e-002

C3 : 1.316300e-002

D1 : 3.513100e-002

D2 : 0.000000e+000

T1 : 3.028370e+001

T2 : -2.660010e-004

T3 : 4.083110e-006

T4 : 2.653090e-009

T5 : 0.000000e+000

Slope : 1.00004242

Offset : -0.69458

AD590M : 1.281640e-002

AD590B : -9.225620e+000

4) Frequency 3, Temperature, 2

Serial number : 0657

Calibrated on : 27-Jan-16

G : 4.82397648e-003

H : 6.73161224e-004

I : 2.63298541e-005

J : 2.12078806e-006

F0 : 1000.000

Slope : 1.00000000

Offset : 0.0000

5) Frequency 4, Conductivity, 2

Serial number : 3079

Calibrated on : 28-Jan-16

G : -9.82016649e+000

H : 1.38280691e+000

I : 2.64310227e-004

J : 5.72014580e-005

CTcor : 3.2500e-006

CPcor : -9.57000000e-008

Slope : 1.00000000

Offset : 0.00000

6) A/D voltage 0, Oxygen, SBE 43

Serial number : 0769
Calibrated on : 09-Feb-16
Equation : Sea-Bird
Soc : 4.83260e-001
Offset : -5.06700e-001
A : -3.71260e-003
B : 1.36620e-004
C : -2.43730e-006
E : 3.60000e-002
Tau20 : 1.14000e+000
D1 : 1.92634e-004
D2 : -4.64803e-002
H1 : -3.30000e-002
H2 : 5.00000e+003
H3 : 1.45000e+003

7) A/D voltage 1, Oxygen, SBE 43, 2

Serial number : 0803
Calibrated on : 09-Feb-16
Equation : Sea-Bird
Soc : 4.42080e-001
Offset : -5.32300e-001
A : -4.34410e-003
B : 1.93240e-004
C : -2.77750e-006
E : 3.60000e-002
Tau20 : 2.22000e+000
D1 : 1.92634e-004
D2 : -4.64803e-002

H1 : -3.30000e-002

H2 : 5.00000e+003

H3 : 1.45000e+003

8) A/D voltage 2, Altimeter

Serial number : 937

Calibrated on : BrandNew_2016

Scale factor : 14.940

Offset : 0.000

9) A/D voltage 3, Transmissometer, WET Labs C-Star

Serial number : 868-DR

Calibrated on : 03-08-2016

M : 20.3024

B : -1.1572

Path length : 0.250

10) A/D voltage 4, Fluorometer, WET Labs ECO CDOM

Serial number : 742

Calibrated on : 22 May 2007

Dark output : 0.037

Scale factor : 100.000

11) A/D voltage 5, Free

12) A/D voltage 6, Fluorometer, Chelsea UV Aquatracka

Serial number : 11-8186-001

Calibrated on : 12/01/2015

A : 0.001101

B : -0.018348

13) A/D voltage 7, Free

14) SPAR voltage, Unavailable

15) SPAR voltage, SPAR/Surface Irradiance

Serial number : 6409

Calibrated on : 14 Mar 2016

Conversion factor : 1613.27684000

Ratio multiplier : 1.00000000

Scan length : 40

Pump Control

This setting is only applicable to a custom build of the SBE 9plus.

Enable pump on / pump off commands: NO

Data Acquisition:

Archive data: YES

Delay archiving: NO

Data archive: D:\CTD Data\2016\PE16_25_Bower_CTD\lan009.hex

Timeout (seconds) at startup: 60

Timeout (seconds) between scans: 20

Instrument port configuration:

Port = COM8

Baud rate = 19200

Parity = N

Data bits = 8

Stop bits = 1

Water Sampler Data:

Water Sampler Type: SBE Carousel

Number of bottles: 24

Port: COM7

Enable remote firing: NO

Firing sequence: Sequential

Tone for bottle fire confirmation uses PC sound card.

Header information:

Header Choice = Include Default Header Information in File

TCP/IP - port numbers:

Data acquisition:

Data port: 49163

Status port: 49165

Command port: 49164

Remote bottle firing:

Command port: 49167

Status port: 49168

Remote data publishing:

Converted data port: 49161

Raw data port: 49160

Miscellaneous data for calculations

Depth, Average Sound Velocity, and TEOS-10

Latitude when NMEA is not available: 0.00000000

Longitude when NMEA is not available: 0.00000000

Average Sound Velocity

Minimum pressure [db]: 20.00000000

Minimum salinity [psu]: 20.00000000

Pressure window size [db]: 20.00000000

Time window size [s]: 60.00000000

Descent and Acceleration

Window size [s]: 2.00000000

Plume Anomaly

Theta-B: 0.00000000

Salinity-B 0.00000000

Theta-Z / Salinity-Z 0.00000000

Reference pressure [db] 0.00000000

Oxygen

Window size [s]: 2.00000000

Apply hysteresis correction: 1

Apply Tau correction: 1

Potential Temperature Anomaly

A0: 0.00000000

A1: 0.00000000

A1 Multiplier: Salinity

Serial Data Output:

Output data to serial port: NO

Mark Variables:

Variables:

Digits	Variable Name [units]
0	Scan Count
4	Depth [salt water, m]
7	Conductivity [S/m]
5	Salinity, Practical [PSU]

6 Oxygen, SBE 43 [mg/l]

5 Temperature [ITS-90, deg C]

Shared File Output:

Output data to shared file: NO

TCP/IP Output:

Raw data:

Output raw data to socket: NO

XML wrapper and settings: NO

Seconds between raw data updates: 0.00000000

Converted data:

Output converted data to socket: NO

XML format: NO

SBE 11plus Deck Unit Alarms

Enable minimum pressure alarm: NO

Enable maximum pressure alarm: NO

Enable altimeter alarm: NO

SBE 14 Remote Display

Enable SBE 14 Remote Display: NO

PC Alarms

Enable minimum pressure alarm: NO

Enable maximum pressure alarm: NO

Enable altimeter alarm: NO

Enable bottom contact alarm: NO

Alarm uses PC sound card.

Options:

Prompt to save program setup changes: YES

Automatically save program setup changes on exit: NO

Confirm instrument configuration change: YES

Confirm display setup changes: YES

Confirm output file overwrite: YES

Check scan length: YES

Compare serial numbers: YES

Maximized plot may cover Seasave: NO

7.3 APPENDIX C: ADCP processing logbooks

7.3.1 ADCP WH1200 kHz

```
2016-06-26 17:22:31,843 INFO     quick_adcp   importing numpy version 1.8.2
2016-06-26 17:22:31,855 INFO     quick_adcp   importing matplotlib version 1.4.3
2016-06-26 17:22:32,003 INFO     quick_adcp
=====================================================
2016-06-26 17:22:32,003 INFO     quick_adcp
=====================================================
2016-06-26 17:22:32,003 INFO     quick_adcp   command line was:
/usr/local/currents/bin/run_quick.py -d wh1200
2016-06-26 17:22:32,003 INFO     quick_adcp   cwd is
/home/data/PE16_25_Bower_ADCP/proc/wh1200
about to run these steps:
 - write_clearflags
 - scandata
 - avg_and_load
 - codaseditsetup
 - setflags
 - getnav
```

- lst_hdg
- plot_headcorr
- navsteps
- find_pflags
- apply_edit
- navsteps
- lst_temp
- plot_temp
- lst_npings
- calib
- matfiles
- adcpsect
- refabs
- smoothnav
- putnav
- refplots
- find_pflags
- codaseditsetup

```
2016-06-26 17:22:32,028 INFO    quick_adcp   ------------------------------------------
2016-06-26 17:22:32,028 INFO    quick_adcp   step 1: set up files in "edit"
directory

2016-06-26 17:22:32,028 INFO    quick_adcp   ------------------------------------------
2016-06-26 17:22:32,028 INFO    quick_adcp   step 2: scan files for time range

2016-06-26 17:22:32,126 INFO    quick_adcp   looking for database with
adcpdb/a_pe*.blk
2016-06-26 17:22:32,127 INFO    quick_adcp   database found: listing blocks
2016-06-26 17:22:32,142 INFO    quick_adcp   ------------------------------------------
2016-06-26 17:22:32,142 INFO    quick_adcp   step 3: generate averaged data...
2016-06-26 17:22:32,180 INFO    quick_adcp   ------------------------------------------
```

2016-06-26 17:22:32,180 INFO quick_adcp step 4: load averaged data (to database)
2016-06-26 17:22:32,250 INFO quick_adcp database time range:
2016-06-26 17:22:32,251 INFO quick_adcp 2016/06/15 07:54:30 to 2016/06/26 17:22:31
2016-06-26 17:22:32,251 INFO quick_adcp (166.329514 to 177.723970)
2016-06-26 17:22:32,292 INFO quick_adcp --
2016-06-26 17:22:32,292 INFO quick_adcp step 5: set up files for codas editing (gautoedit.py)

2016-06-26 17:22:32,292 INFO quick_adcp --
2016-06-26 17:22:32,292 INFO quick_adcp step 6: run setflags?

2016-06-26 17:22:32,362 INFO quick_adcp --
2016-06-26 17:22:32,362 INFO quick_adcp step 7: get navigation

2016-06-26 17:22:32,760 INFO quick_adcp --
2016-06-26 17:22:32,760 INFO quick_adcp step 8: list heading

2016-06-26 17:22:32,806 INFO quick_adcp --
2016-06-26 17:22:32,806 INFO quick_adcp step 9: plot heading correction

2016-06-26 17:22:33,472 INFO quick_adcp

2016-06-26 17:22:33,472 INFO quick_adcp ---- running navsteps ---
2016-06-26 17:22:33,472 INFO quick_adcp ------------------------
2016-06-26 17:22:33,472 INFO quick_adcp step 10: nav steps: run adcpsect
2016-06-26 17:22:33,472 INFO quick_adcp navstep 1
2016-06-26 17:22:33,570 INFO quick_adcp ------------------------
2016-06-26 17:22:33,570 INFO quick_adcp step 11: nav steps: run refabs
2016-06-26 17:22:33,570 INFO quick_adcp navstep 2

2016-06-26 17:22:33,627 INFO quick_adcp ------------------------
2016-06-26 17:22:33,628 INFO quick_adcp step 12: nav steps: run smoothr for plots
2016-06-26 17:22:33,628 INFO quick_adcp navstep 3
2016-06-26 17:22:33,941 INFO quick_adcp ------------------------
2016-06-26 17:22:33,941 INFO quick_adcp step 13: nav steps: smooth navigation for velocities
2016-06-26 17:22:33,941 INFO quick_adcp navstep 4
2016-06-26 17:22:34,249 INFO quick_adcp ------------------------
2016-06-26 17:22:34,249 INFO quick_adcp step 14: nav steps: put positions and uvship from refsm into codasdb
2016-06-26 17:22:34,249 INFO quick_adcp navstep 5
2016-06-26 17:22:34,681 INFO quick_adcp ------------------------
2016-06-26 17:22:34,681 INFO quick_adcp step 15: nav steps: make reflayer plots
2016-06-26 17:22:34,681 INFO quick_adcp navstep 6
2016-06-26 17:22:35,382 INFO quick_adcp ---
2016-06-26 17:22:35,382 INFO quick_adcp step 10: find profile flags

2016-06-26 17:22:35,624 INFO quick_adcp ---
2016-06-26 17:22:35,624 INFO quick_adcp step 11: apply editing

2016-06-26 17:22:35,737 INFO quick_adcp ---
2016-06-26 17:22:35,737 INFO quick_adcp step 12: run calibration steps

2016-06-26 17:22:36,761 INFO quick_adcp ---
2016-06-26 17:22:36,761 INFO quick_adcp step 13: extract and plot temperature

2016-06-26 17:22:37,100 INFO quick_adcp ---

2016-06-26 17:22:37,100 INFO   quick_adcp   step 14: extract and plot number of pings per ensemble

2016-06-26 17:22:37,307 INFO   quick_adcp   --
2016-06-26 17:22:37,308 INFO   quick_adcp   step 15: extract matlab "allbins"

2016-06-26 17:22:37,844 INFO   quick_adcp   --
2016-06-26 17:22:37,844 INFO   quick_adcp   writing "cruise_info.txt"

7.3.2 ADCP WH300 kHz

2016-06-26 17:22:46,951 INFO   quick_adcp   importing numpy version 1.8.2
2016-06-26 17:22:46,967 INFO   quick_adcp   importing matplotlib version 1.4.3
2016-06-26 17:22:47,110 INFO   quick_adcp
==
2016-06-26 17:22:47,110 INFO   quick_adcp
==
2016-06-26 17:22:47,110 INFO   quick_adcp   command line was:
/usr/local/currents/bin/run_quick.py -d wh300
2016-06-26 17:22:47,110 INFO   quick_adcp   cwd is
/home/data/PE16_25_Bower_ADCP/proc/wh300
about to run these steps:
 - write_clearflags
 - scandata
 - avg_and_load
 - codaseditsetup
 - setflags
 - getnav
 - lst_hdg
 - plot_headcorr

- navsteps
- find_pflags
- apply_edit
- navsteps
- lst_temp
- plot_temp
- lst_npings
- calib
- matfiles
- adcpsect
- refabs
- smoothnav
- putnav
- refplots
- find_pflags
- codaseditsetup

2016-06-26 17:22:47,136 INFO quick_adcp --
2016-06-26 17:22:47,136 INFO quick_adcp step 1: set up files in "edit" directory

2016-06-26 17:22:47,136 INFO quick_adcp --
2016-06-26 17:22:47,136 INFO quick_adcp step 2: scan files for time range

2016-06-26 17:22:47,229 INFO quick_adcp looking for database with adcpdb/a_pe*.blk
2016-06-26 17:22:47,230 INFO quick_adcp database found: listing blocks
2016-06-26 17:22:47,244 INFO quick_adcp --
2016-06-26 17:22:47,244 INFO quick_adcp step 3: generate averaged data...
2016-06-26 17:22:47,276 INFO quick_adcp --
2016-06-26 17:22:47,276 INFO quick_adcp step 4: load averaged data (to database)

2016-06-26 17:22:47,336 INFO quick_adcp database time range:
2016-06-26 17:22:47,336 INFO quick_adcp 2016/06/15 07:54:30 to 2016/06/26 17:22:31
2016-06-26 17:22:47,336 INFO quick_adcp (166.329514 to 177.723970)
2016-06-26 17:22:47,377 INFO quick_adcp --
2016-06-26 17:22:47,377 INFO quick_adcp step 5: set up files for codas editing (gautoedit.py)

2016-06-26 17:22:47,378 INFO quick_adcp --
2016-06-26 17:22:47,378 INFO quick_adcp step 6: run setflags?

2016-06-26 17:22:47,453 INFO quick_adcp --
2016-06-26 17:22:47,454 INFO quick_adcp step 7: get navigation

2016-06-26 17:22:47,866 INFO quick_adcp --
2016-06-26 17:22:47,867 INFO quick_adcp step 8: list heading

2016-06-26 17:22:47,921 INFO quick_adcp --
2016-06-26 17:22:47,921 INFO quick_adcp step 9: plot heading correction

2016-06-26 17:22:48,557 INFO quick_adcp

2016-06-26 17:22:48,557 INFO quick_adcp ---- running navsteps ---
2016-06-26 17:22:48,557 INFO quick_adcp ------------------------
2016-06-26 17:22:48,557 INFO quick_adcp step 10: nav steps: run adcpsect
2016-06-26 17:22:48,557 INFO quick_adcp navstep 1
2016-06-26 17:22:48,655 INFO quick_adcp ------------------------
2016-06-26 17:22:48,656 INFO quick_adcp step 11: nav steps: run refabs
2016-06-26 17:22:48,656 INFO quick_adcp navstep 2
2016-06-26 17:22:48,711 INFO quick_adcp ------------------------

2016-06-26 17:22:48,711 INFO quick_adcp step 12: nav steps: run smoothr for plots

2016-06-26 17:22:48,711 INFO quick_adcp navstep 3

2016-06-26 17:22:49,039 INFO quick_adcp ------------------------

2016-06-26 17:22:49,039 INFO quick_adcp step 13: nav steps: smooth navigation for velocities

2016-06-26 17:22:49,039 INFO quick_adcp navstep 4

2016-06-26 17:22:49,387 INFO quick_adcp ------------------------

2016-06-26 17:22:49,388 INFO quick_adcp step 14: nav steps: put positions and uvship from refsm into codasdb

2016-06-26 17:22:49,388 INFO quick_adcp navstep 5

2016-06-26 17:22:49,819 INFO quick_adcp ------------------------

2016-06-26 17:22:49,819 INFO quick_adcp step 15: nav steps: make reflayer plots

2016-06-26 17:22:49,819 INFO quick_adcp navstep 6

2016-06-26 17:22:50,524 INFO quick_adcp --

2016-06-26 17:22:50,524 INFO quick_adcp step 10: find profile flags

2016-06-26 17:22:50,808 INFO quick_adcp --

2016-06-26 17:22:50,808 INFO quick_adcp step 11: apply editing

2016-06-26 17:22:50,919 INFO quick_adcp --

2016-06-26 17:22:50,919 INFO quick_adcp step 12: run calibration steps

2016-06-26 17:22:52,028 INFO quick_adcp --

2016-06-26 17:22:52,028 INFO quick_adcp step 13: extract and plot temperature

2016-06-26 17:22:52,381 INFO quick_adcp --

2016-06-26 17:22:52,381 INFO quick_adcp step 14: extract and plot number of pings per ensemble

2016-06-26 17:22:52,608 INFO quick_adcp --

2016-06-26 17:22:52,609 INFO quick_adcp step 15: extract matlab "allbins"

2016-06-26 17:22:53,385 INFO quick_adcp --

2016-06-26 17:22:53,385 INFO quick_adcp writing "cruise_info.txt"

7.3.3 ADCP OS75kHz

2016-06-26 17:23:02,754 INFO quick_adcp importing numpy version 1.8.2

2016-06-26 17:23:02,770 INFO quick_adcp importing matplotlib version 1.4.3

2016-06-26 17:23:02,912 INFO quick_adcp

===

2016-06-26 17:23:02,912 INFO quick_adcp

===

2016-06-26 17:23:02,912 INFO quick_adcp command line was:

/usr/local/currents/bin/run_quick.py -d os75nb

2016-06-26 17:23:02,912 INFO quick_adcp cwd is

/home/data/PE16_25_Bower_ADCP/proc/os75nb

about to run these steps:

- write_clearflags
- scandata
- avg_and_load
- codaseditsetup
- setflags
- getnav
- lst_hdg
- plot_headcorr
- navsteps
- find_pflags
- apply_edit

- navsteps
- lst_temp
- plot_temp
- lst_npings
- calib
- matfiles
- adcpsect
- refabs
- smoothnav
- putnav
- refplots
- find_pflags
- codaseditsetup

2016-06-26 17:23:02,924 INFO   quick_adcp   --
2016-06-26 17:23:02,924 INFO   quick_adcp   step 1: set up files in "edit" directory

2016-06-26 17:23:02,924 INFO   quick_adcp   --
2016-06-26 17:23:02,924 INFO   quick_adcp   step 2: scan files for time range

2016-06-26 17:23:03,036 INFO   quick_adcp   looking for database with adcpdb/a_pe*.blk
2016-06-26 17:23:03,036 INFO   quick_adcp   database found: listing blocks
2016-06-26 17:23:03,049 INFO   quick_adcp   --
2016-06-26 17:23:03,050 INFO   quick_adcp   step 3: generate averaged data...
2016-06-26 17:23:03,080 INFO   quick_adcp   --
2016-06-26 17:23:03,080 INFO   quick_adcp   step 4: load averaged data (to database)
2016-06-26 17:23:03,157 INFO   quick_adcp   database time range:
2016-06-26 17:23:03,158 INFO   quick_adcp   2016/06/15 07:57:31 to 2016/06/26 17:22:30

2016-06-26 17:23:03,158 INFO quick_adcp (166.331609 to 177.723958)
2016-06-26 17:23:03,185 INFO quick_adcp --
2016-06-26 17:23:03,186 INFO quick_adcp step 5: set up files for codas editing (gautoedit.py)

2016-06-26 17:23:03,186 INFO quick_adcp --
2016-06-26 17:23:03,186 INFO quick_adcp step 6: run setflags?

2016-06-26 17:23:03,227 INFO quick_adcp --
2016-06-26 17:23:03,227 INFO quick_adcp step 7: get navigation

2016-06-26 17:23:03,549 INFO quick_adcp --
2016-06-26 17:23:03,549 INFO quick_adcp step 8: list heading

2016-06-26 17:23:03,572 INFO quick_adcp --
2016-06-26 17:23:03,573 INFO quick_adcp step 9: plot heading correction

2016-06-26 17:23:04,176 INFO quick_adcp

2016-06-26 17:23:04,176 INFO quick_adcp ---- running navsteps ---
2016-06-26 17:23:04,176 INFO quick_adcp ------------------------
2016-06-26 17:23:04,176 INFO quick_adcp step 10: nav steps: run adcpsect
2016-06-26 17:23:04,176 INFO quick_adcp navstep 1
2016-06-26 17:23:04,225 INFO quick_adcp ------------------------
2016-06-26 17:23:04,225 INFO quick_adcp step 11: nav steps: run refabs
2016-06-26 17:23:04,225 INFO quick_adcp navstep 2
2016-06-26 17:23:04,256 INFO quick_adcp ------------------------
2016-06-26 17:23:04,256 INFO quick_adcp step 12: nav steps: run smoothr for plots
2016-06-26 17:23:04,256 INFO quick_adcp navstep 3
2016-06-26 17:23:04,374 INFO quick_adcp ------------------------

2016-06-26 17:23:04,374 INFO quick_adcp step 13: nav steps: smooth navigation for velocities
2016-06-26 17:23:04,374 INFO quick_adcp navstep 4
2016-06-26 17:23:04,512 INFO quick_adcp ------------------------
2016-06-26 17:23:04,513 INFO quick_adcp step 14: nav steps: put positions and uvship from refsm into codasdb
2016-06-26 17:23:04,513 INFO quick_adcp navstep 5
2016-06-26 17:23:04,839 INFO quick_adcp ------------------------
2016-06-26 17:23:04,839 INFO quick_adcp step 15: nav steps: make reflayer plots
2016-06-26 17:23:04,839 INFO quick_adcp navstep 6
2016-06-26 17:23:05,409 INFO quick_adcp --
2016-06-26 17:23:05,409 INFO quick_adcp step 10: find profile flags

2016-06-26 17:23:05,533 INFO quick_adcp --
2016-06-26 17:23:05,533 INFO quick_adcp step 11: apply editing

2016-06-26 17:23:05,596 INFO quick_adcp --
2016-06-26 17:23:05,596 INFO quick_adcp step 12: run calibration steps

2016-06-26 17:23:06,541 INFO quick_adcp --
2016-06-26 17:23:06,541 INFO quick_adcp step 13: extract and plot temperature

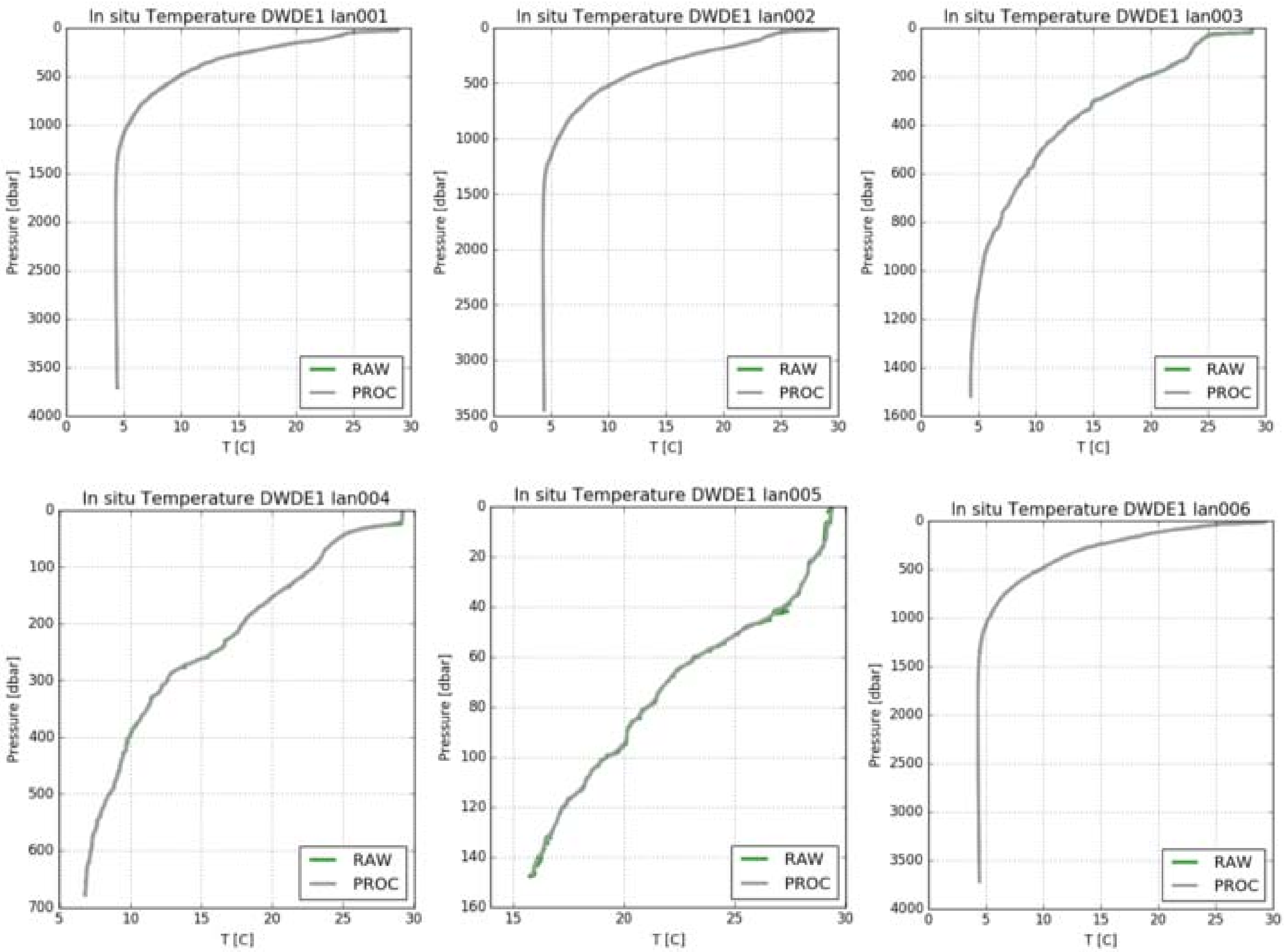
2016-06-26 17:23:06,766 INFO quick_adcp --
2016-06-26 17:23:06,766 INFO quick_adcp step 14: extract and plot number of pings per ensemble

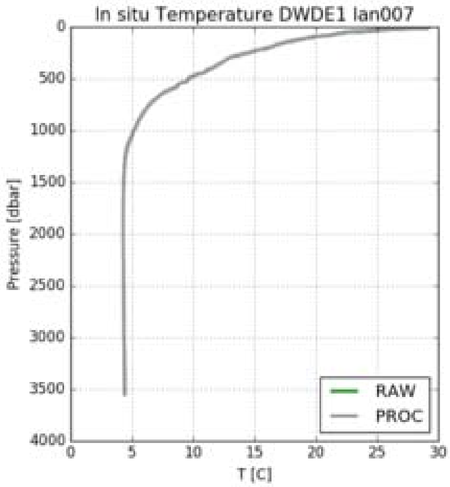
2016-06-26 17:23:06,924 INFO quick_adcp --
2016-06-26 17:23:06,924 INFO quick_adcp step 15: extract matlab "allbins"

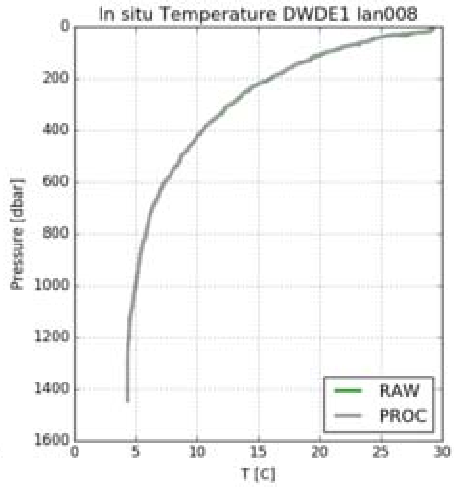
```
2016-06-26 17:23:07,270 INFO     quick_adcp   --------------------------------------------
2016-06-26 17:23:07,270 INFO     quick_adcp   writing "cruise_info.txt"
```

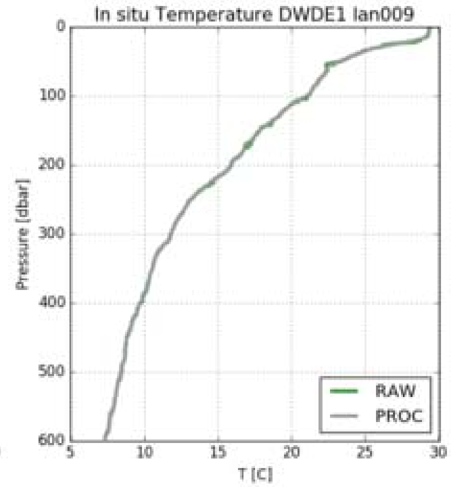
7.4 APPENDIX D CTD PROFILES

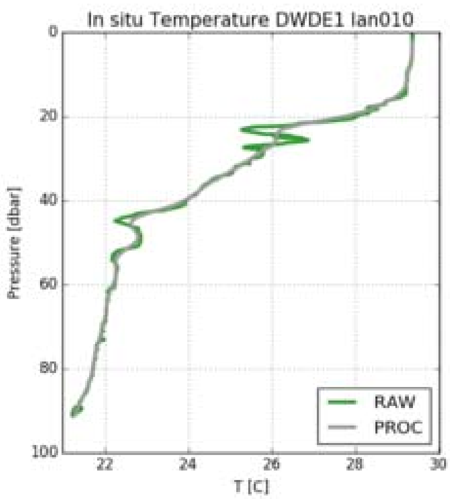
7.4.1 In situ Temperature


In situ Temperature DWDE1 lan001
In situ Temperature DWDE1 lan002
In situ Temperature DWDE1 lan003
In situ Temperature DWDE1 lan004
In situ Temperature DWDE1 lan005
In situ Temperature DWDE1 lan006
Pressure [dbar]
T [C]
RAW
PROC

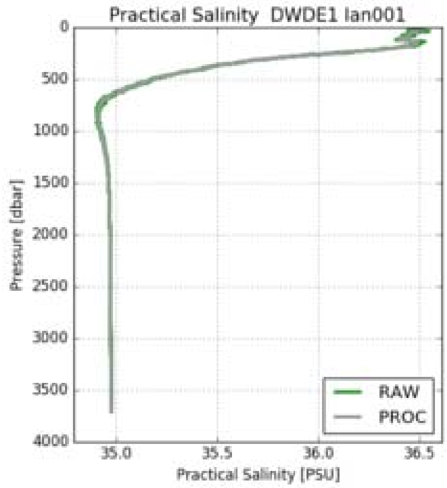

In situ Temperature DWDE1 lan007
Pressure [dbar]
T [C]
RAW
PROC

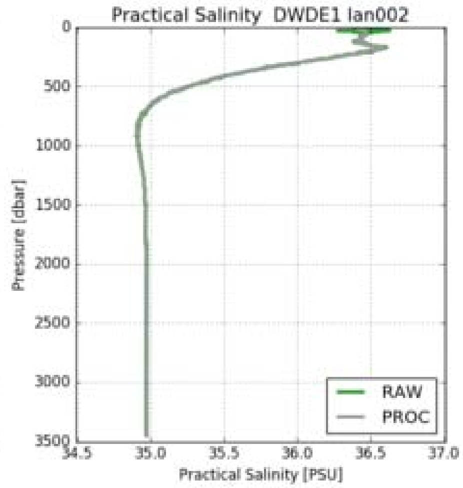

In situ Temperature DWDE1 lan008
Pressure [dbar]
T [C]
RAW
PROC

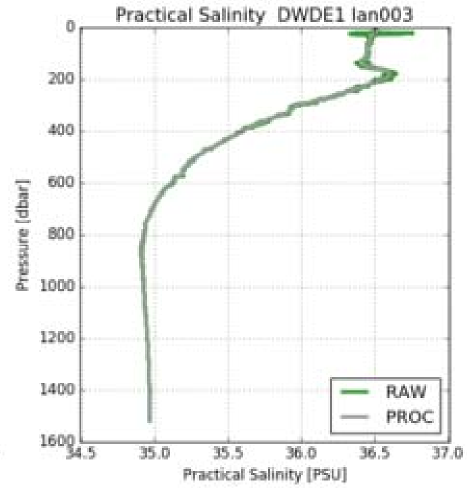

In situ Temperature DWDE1 lan009
Pressure [dbar]
T [C]
RAW
PROC

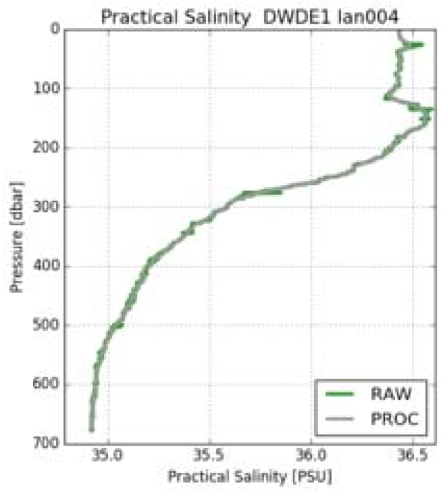

In situ Temperature DWDE1 lan010
Pressure [dbar]
T [C]
RAW
PROC

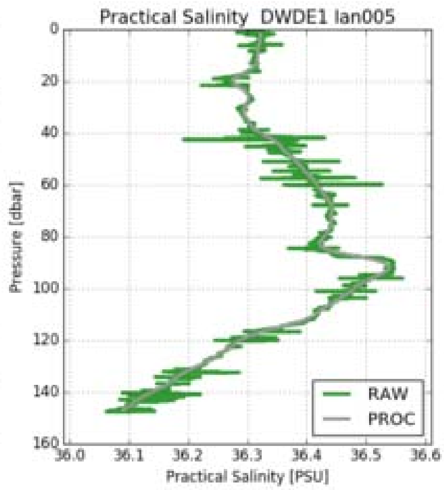
7.4.2 Practical Salinity

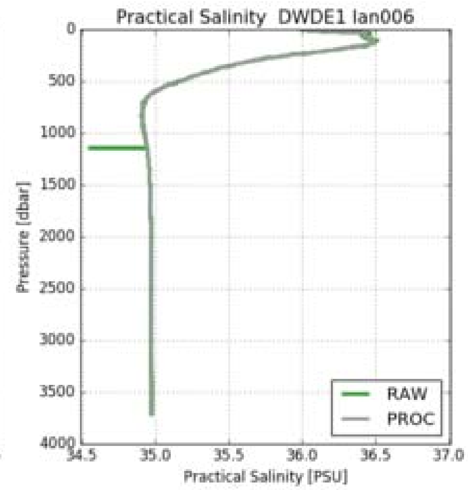


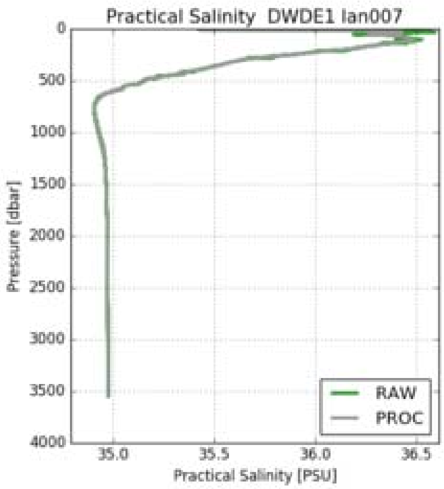


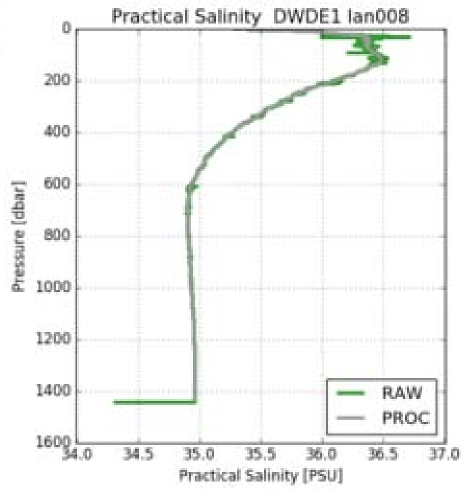


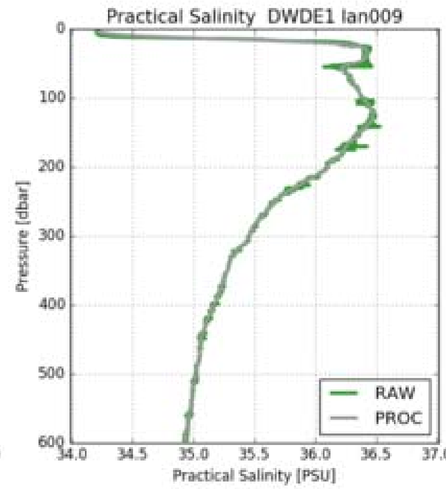


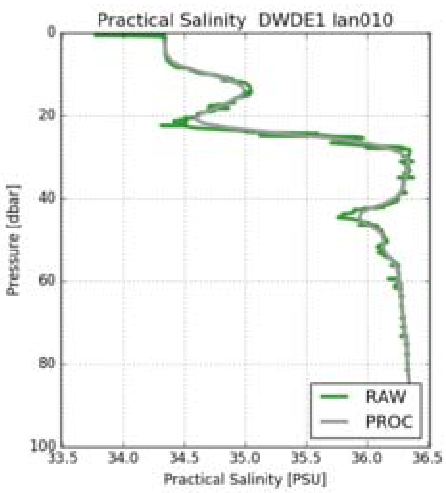




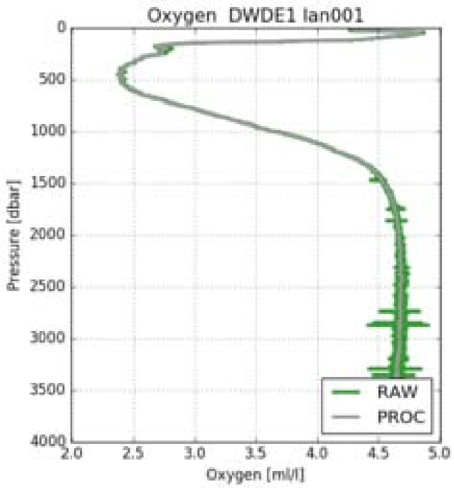

Practical Salinity DWDE1 lan007
Pressure [dbar]
Practical Salinity [PSU]
RAW
PROC

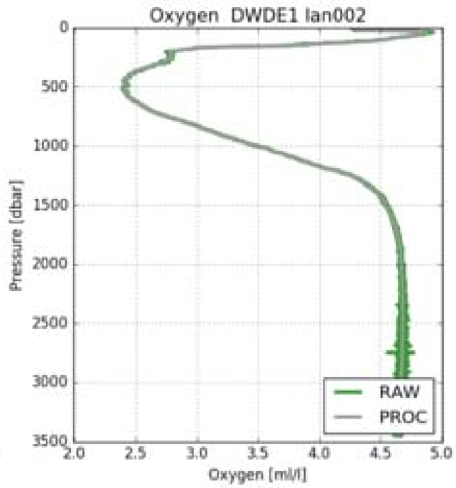

Practical Salinity DWDE1 lan008
Pressure [dbar]
Practical Salinity [PSU]
RAW
PROC

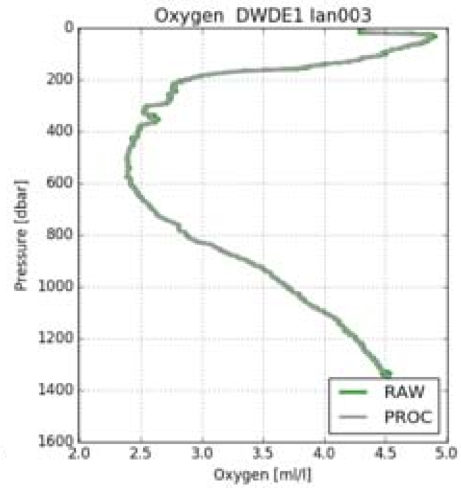

Practical Salinity DWDE1 lan009
Pressure [dbar]
Practical Salinity [PSU]
RAW
PROC

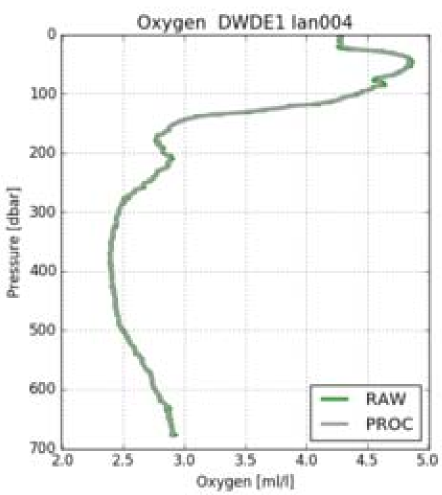

Practical Salinity DWDE1 lan010
Pressure [dbar]
Practical Salinity [PSU]
RAW
PROC

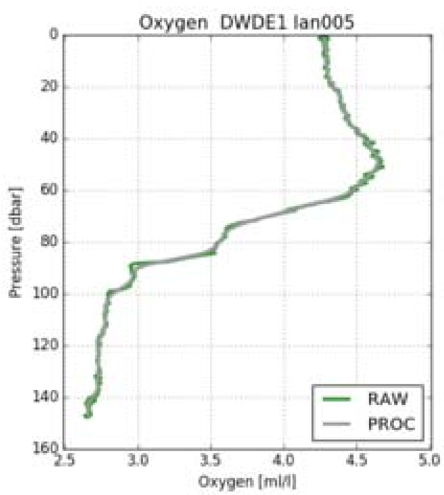
7.4.3 Oxygen

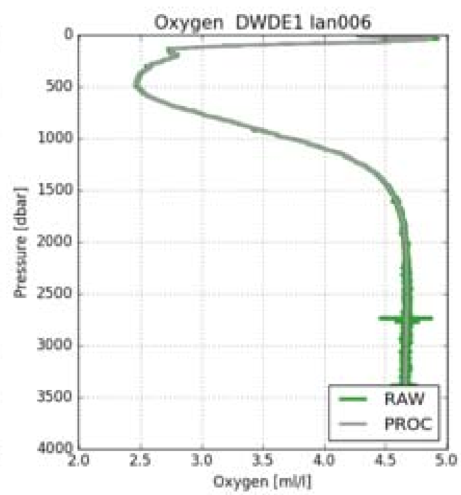

Oxygen DWDE1 lan001
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

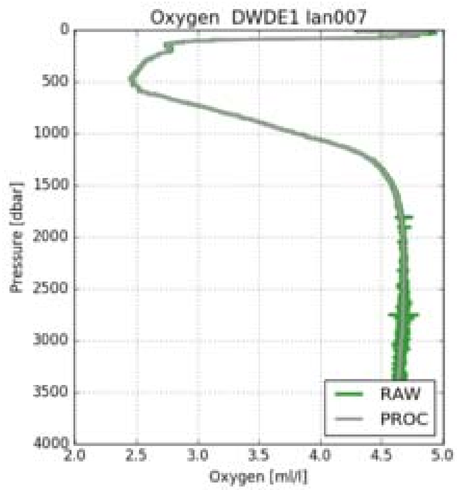

Oxygen DWDE1 lan002
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

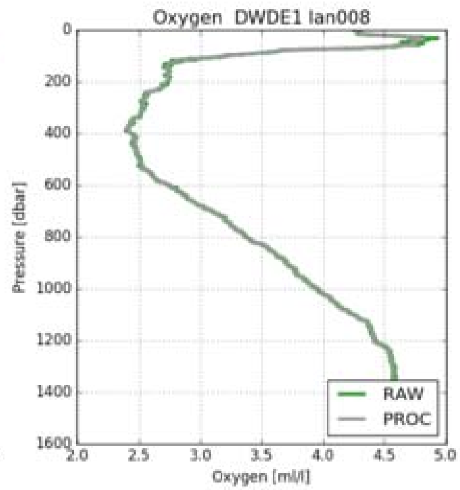

Oxygen DWDE1 lan003
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

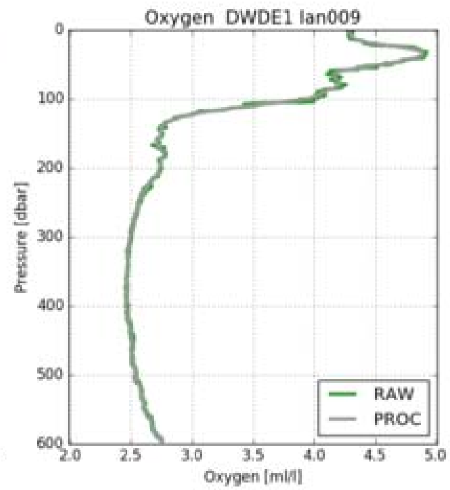

Oxygen DWDE1 lan004
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

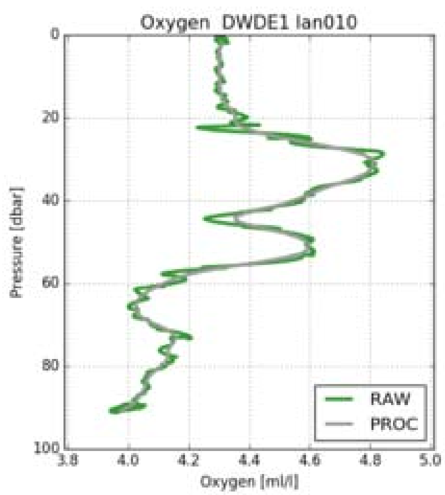

Oxygen DWDE1 lan005
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC


Oxygen DWDE1 lan006
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

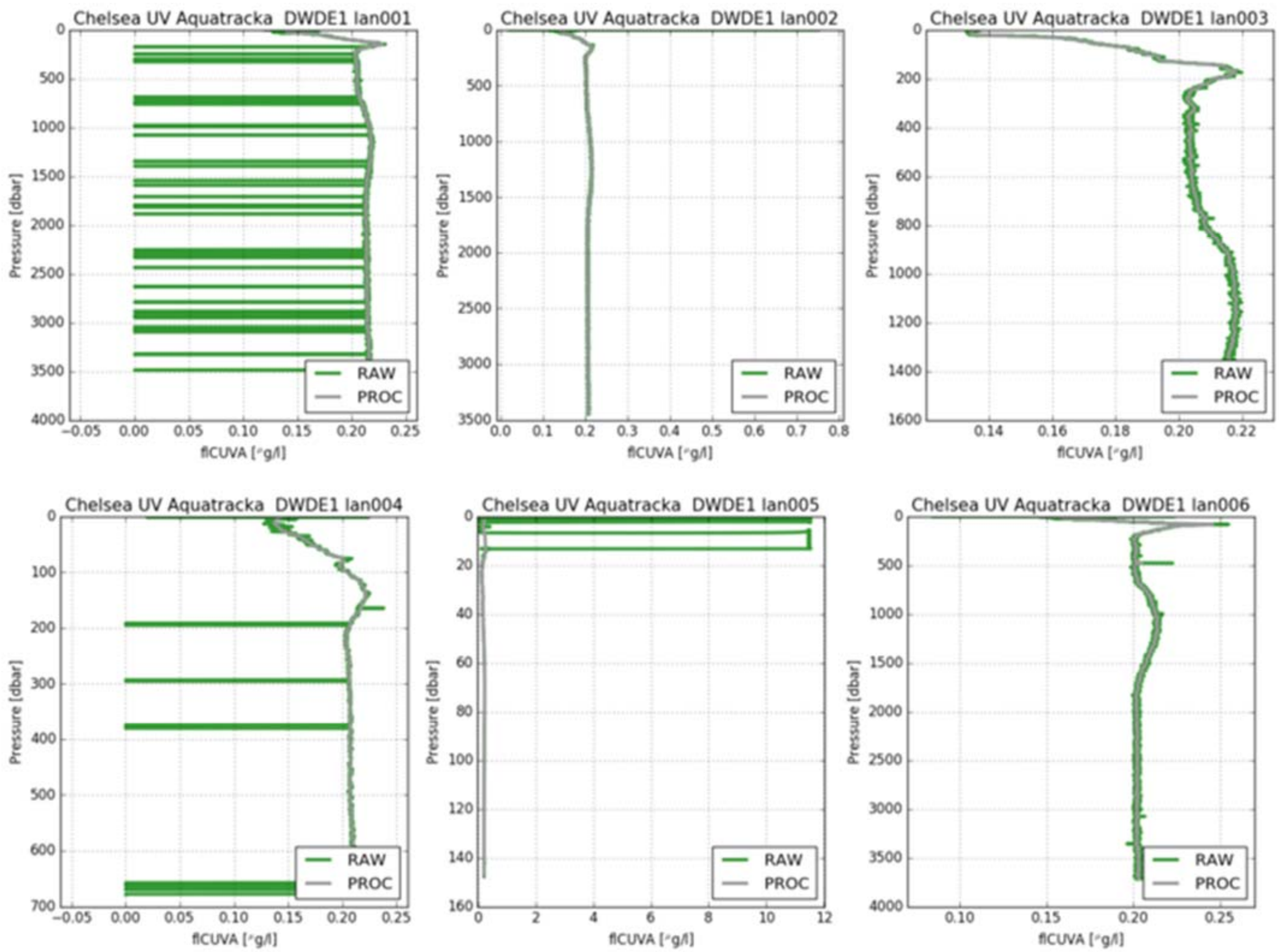

Oxygen DWDE1 lan007
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

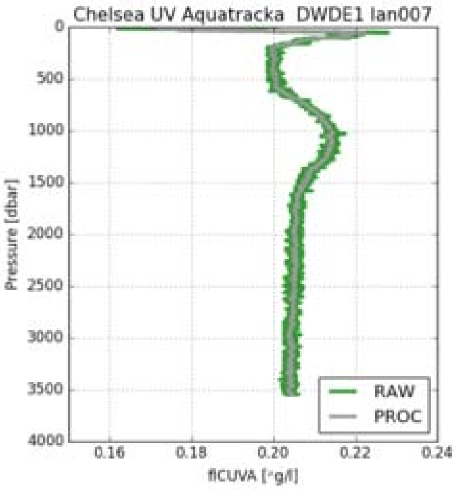

Oxygen DWDE1 lan008
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

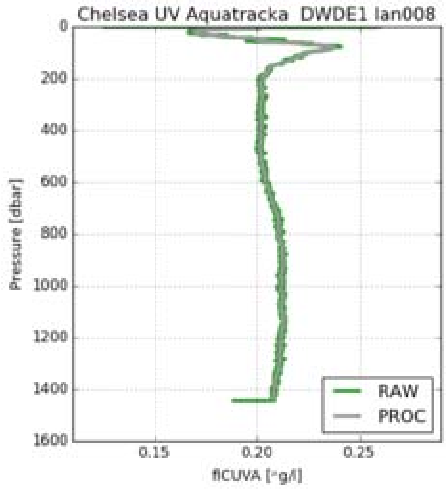

Oxygen DWDE1 lan009
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

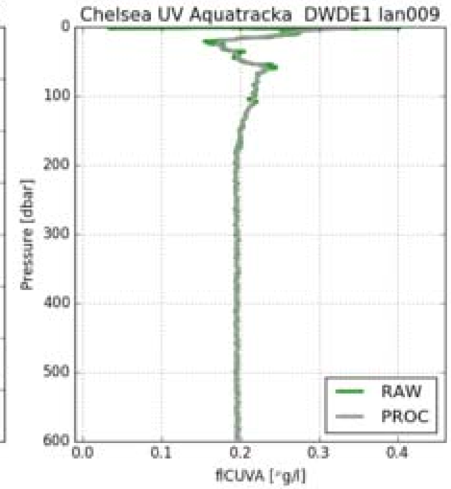

Oxygen DWDE1 lan010
Pressure [dbar]
Oxygen [ml/l]
RAW
PROC

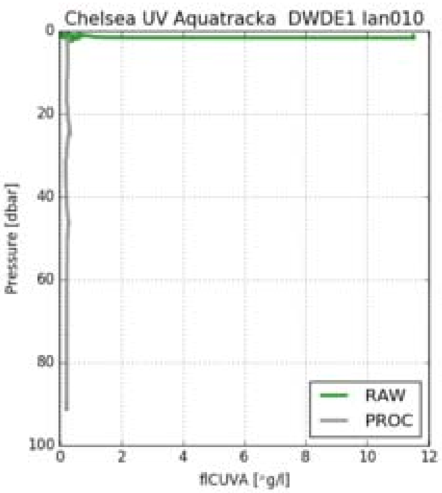
7.4.4 flCUVA Aquatracka



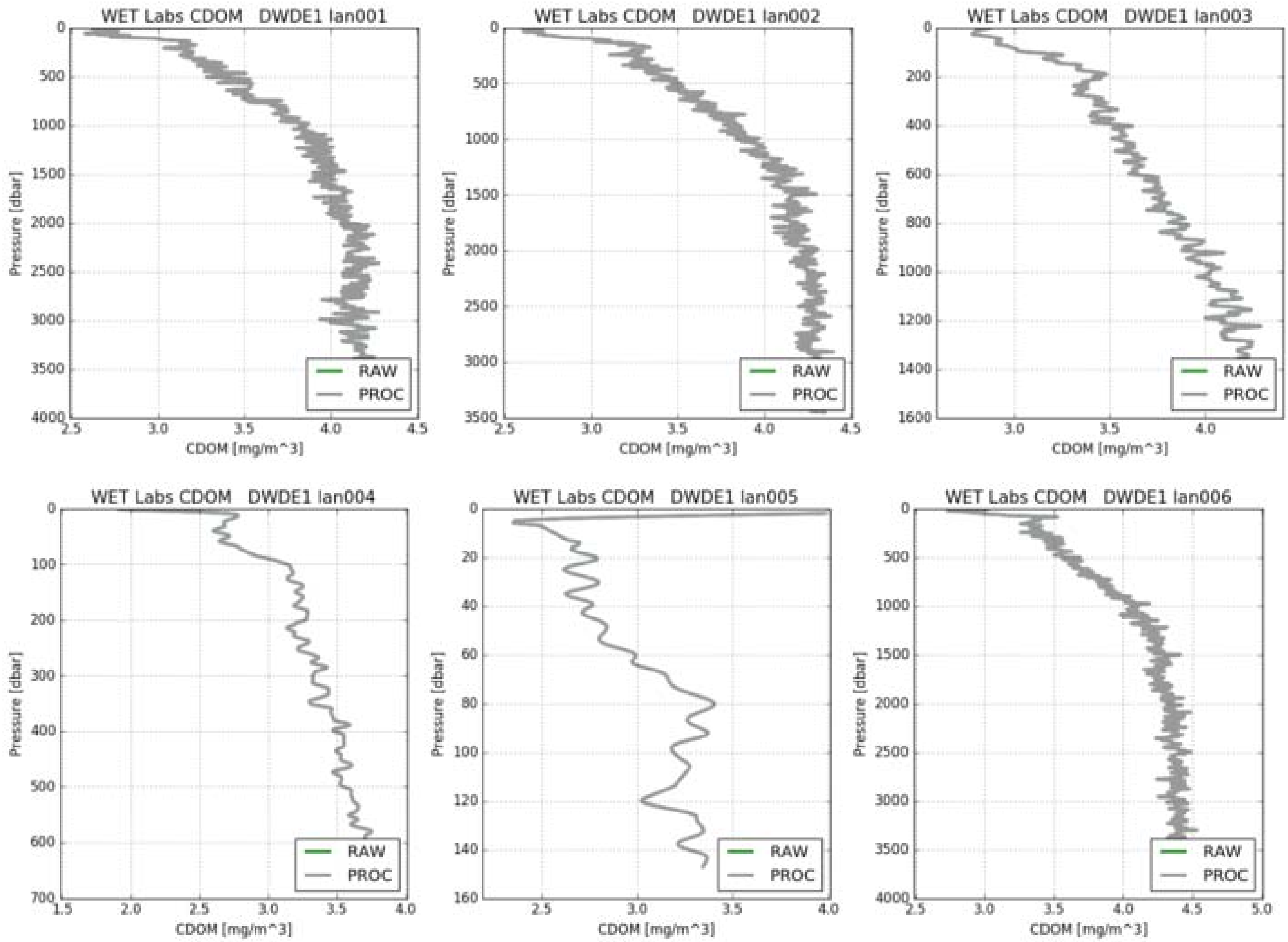

Chelsea UV Aquatracka DWDE1 lan007
Pressure [dbar]
flCUVA
RAW
PROC

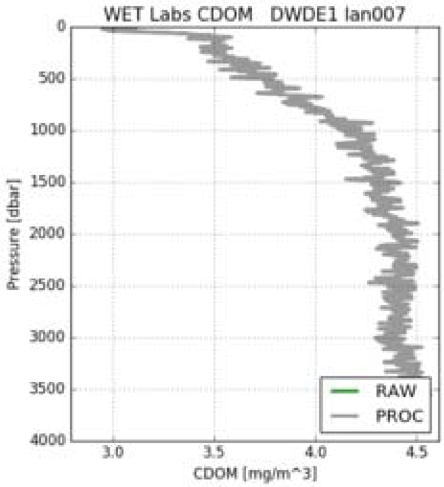

Chelsea UV Aquatracka DWDE1 lan008
Pressure [dbar]
flCUVA
RAW
PROC

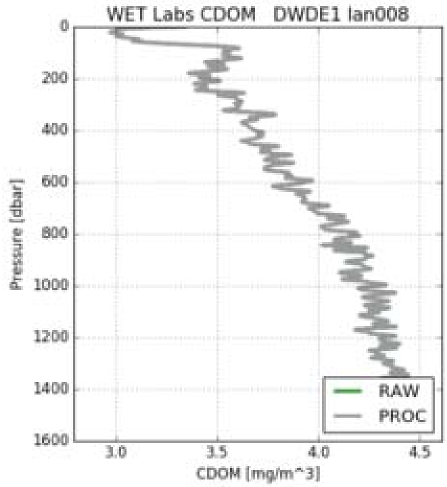

Chelsea UV Aquatracka DWDE1 lan009
Pressure [dbar]
flCUVA
RAW
PROC

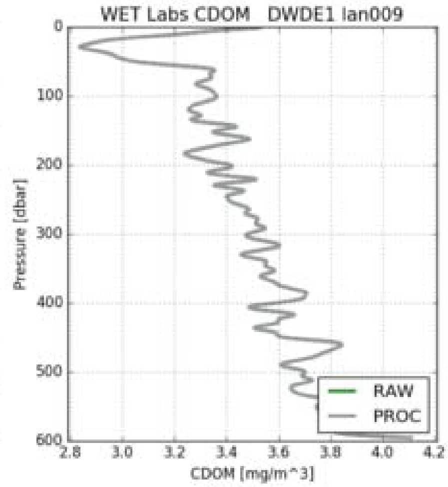

Chelsea UV Aquatracka DWDE1 lan010
Pressure [dbar]
flCUVA
RAW
PROC

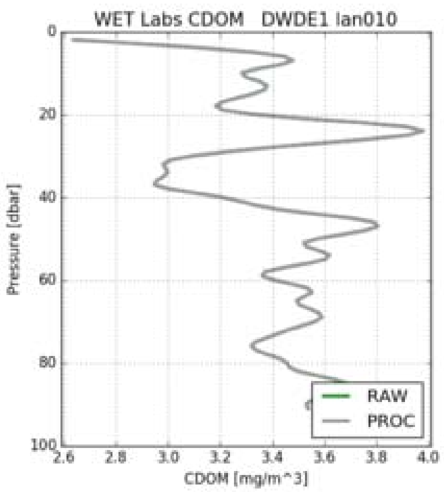
7.4.5 Wetstar CDOM



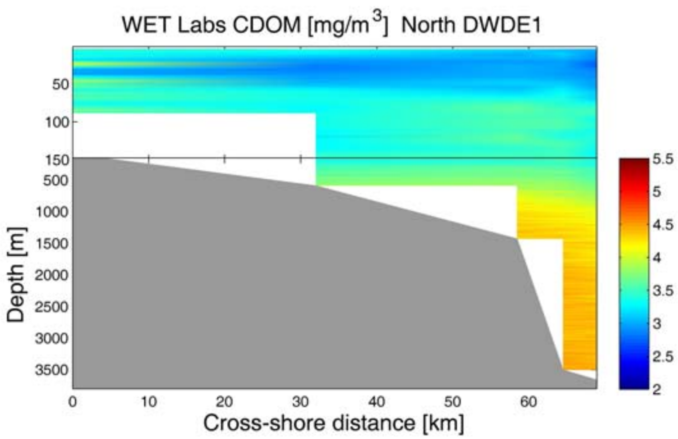

WET Labs CDOM DWDE1 lan007
Pressure [dbar]
CDOM [mg/m^3]
RAW
PROC

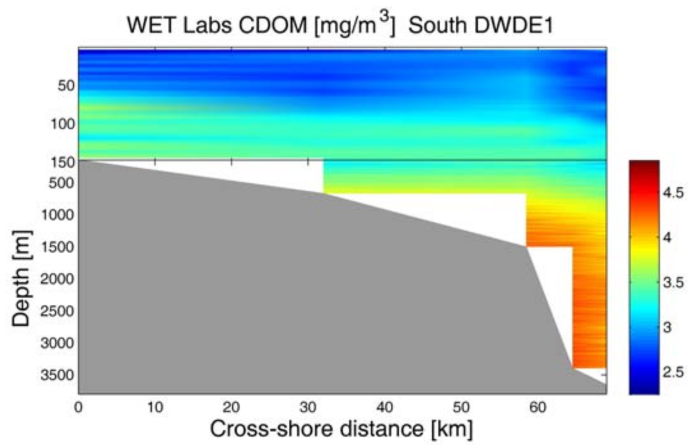

WET Labs CDOM DWDE1 lan008
Pressure [dbar]
CDOM [mg/m^3]
RAW
PROC

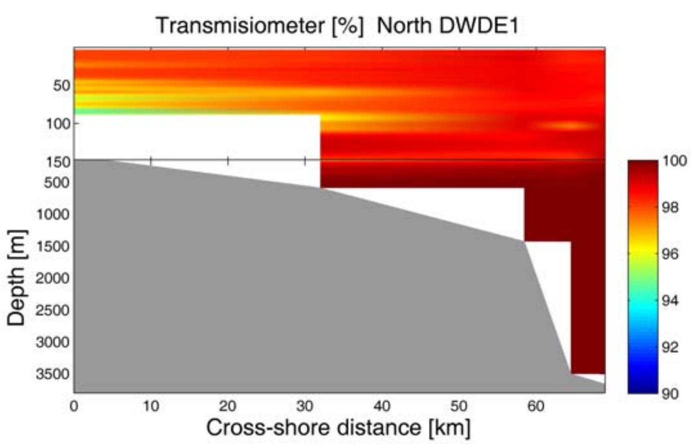

WET Labs CDOM DWDE1 lan009
Pressure [dbar]
CDOM [mg/m^3]
RAW
PROC

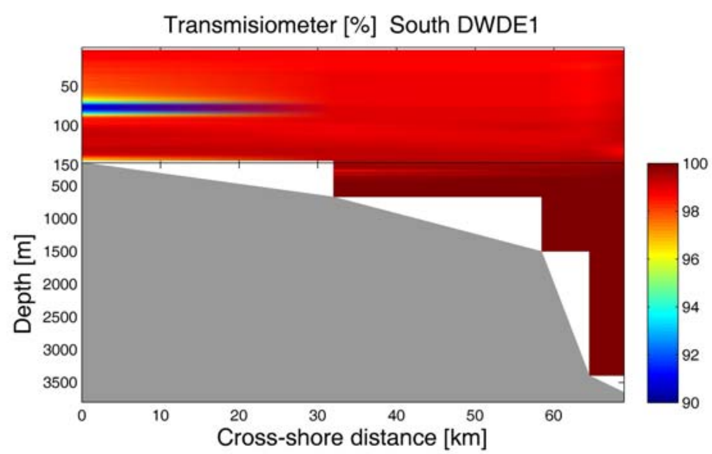

WET Labs CDOM DWDE1 lan010
Pressure [dbar]
CDOM [mg/m^3]
RAW
PROC

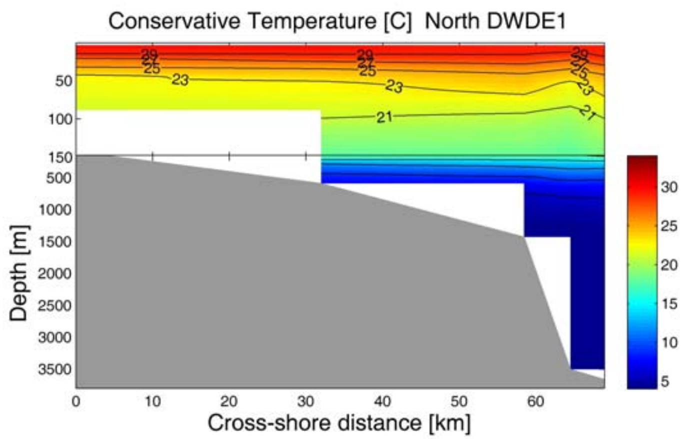
APPENDIX E: CTD CROSS SECTIONS

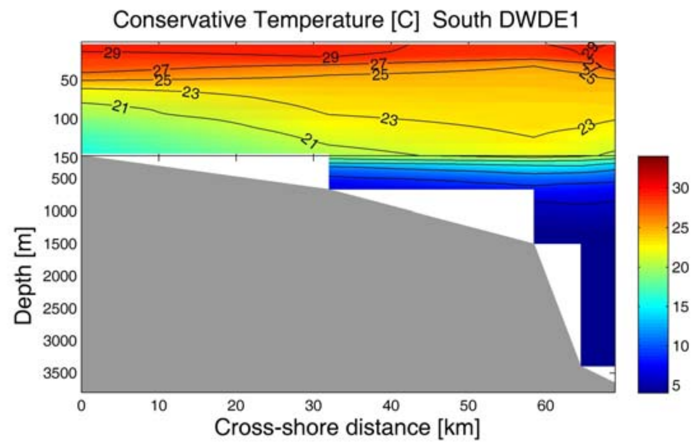


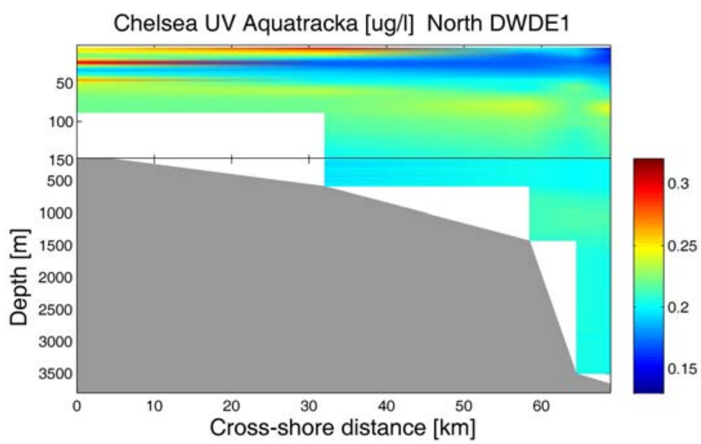


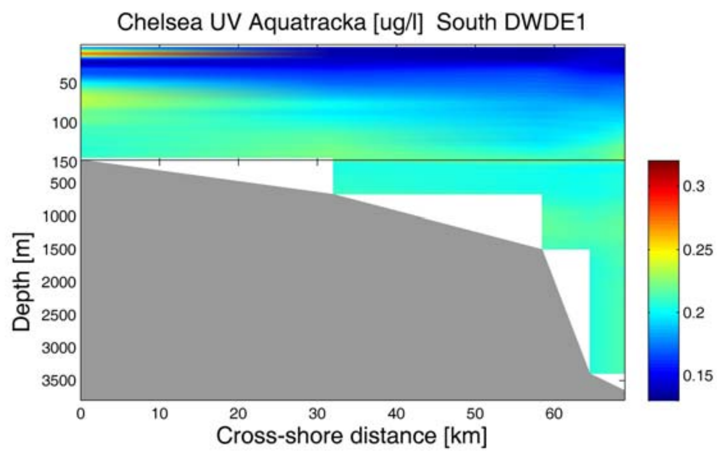


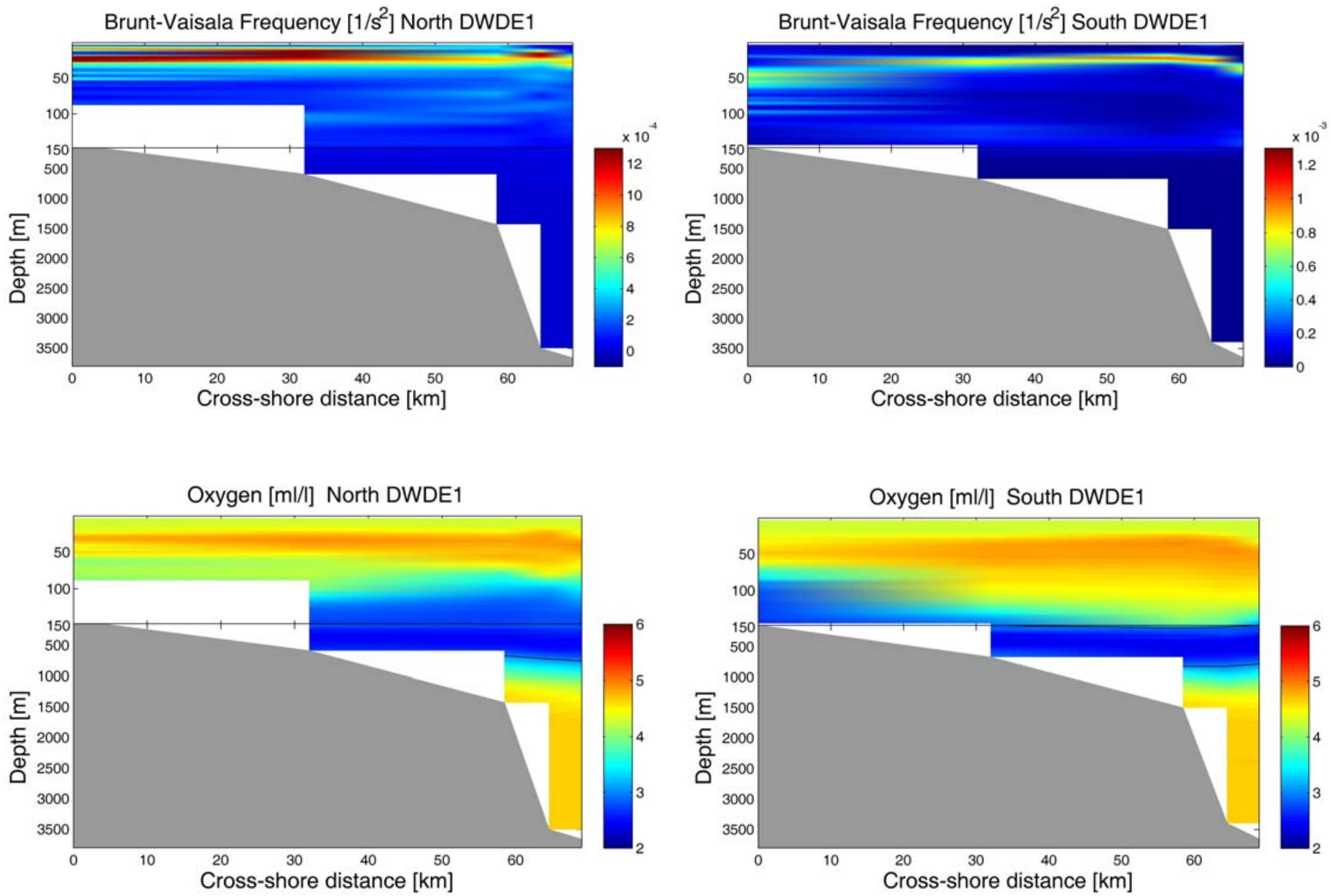



Conservative Temperature [C] North DWDE1
Depth [m]
Cross-shore distance [km]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
29
27
25
23
21
30
25
20
15
10
5

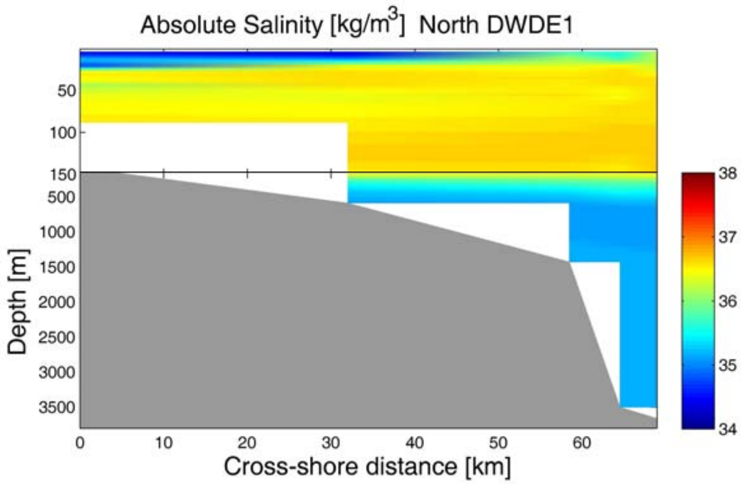

Conservative Temperature [C] South DWDE1
Depth [m]
Cross-shore distance [km]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
29
27
25
23
21
30
25
20
15
10
5

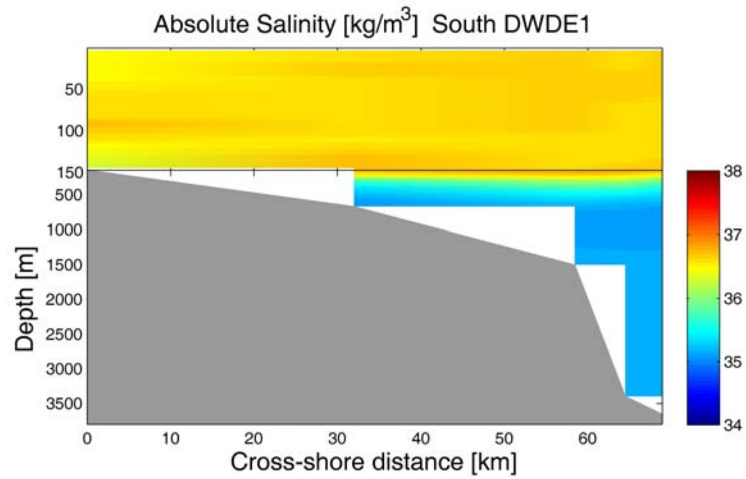

Chelsea UV Aquatracka [ug/l] North DWDE1
Depth [m]
Cross-shore distance [km]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
0.3
0.25
0.2
0.15

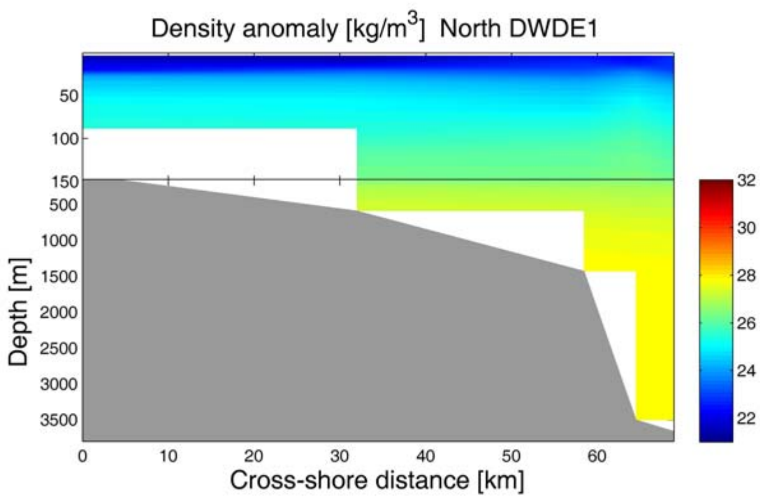

Chelsea UV Aquatracka [ug/l] South DWDE1
Depth [m]
Cross-shore distance [km]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
0.3
0.25
0.2
0.15

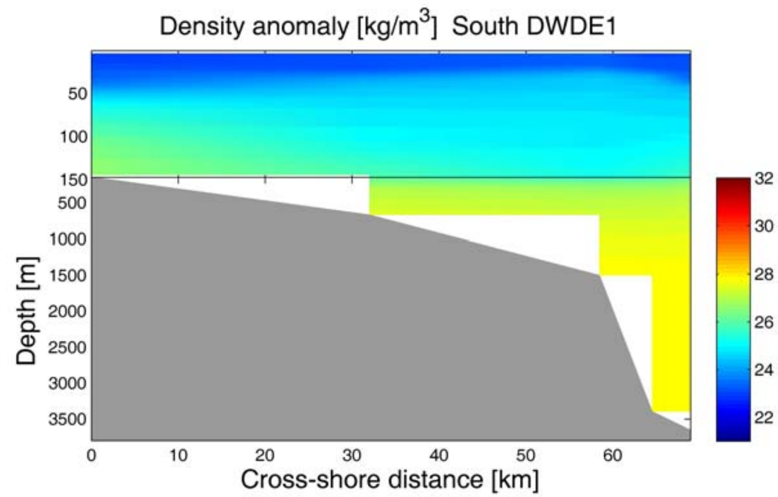


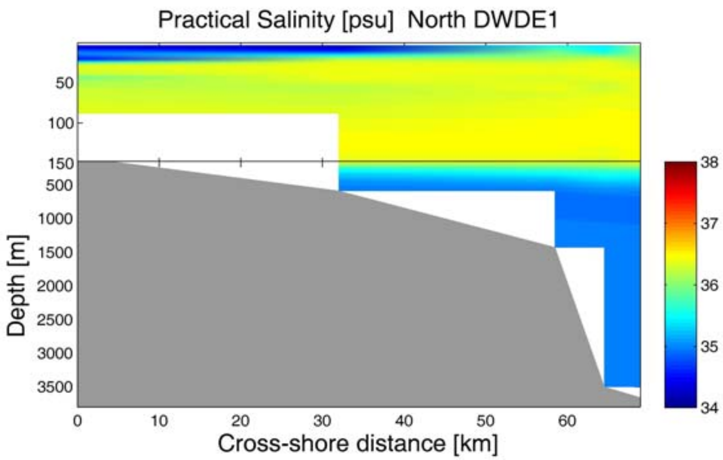
Brunt-Vaisala Frequency [1/s²] North DWDE1
Brunt-Vaisala Frequency [1/s²] South DWDE1
Oxygen [ml/l] North DWDE1
Oxygen [ml/l] South DWDE1
Depth [m]
Cross-shore distance [km]
x 10⁻⁴
x 10⁻³

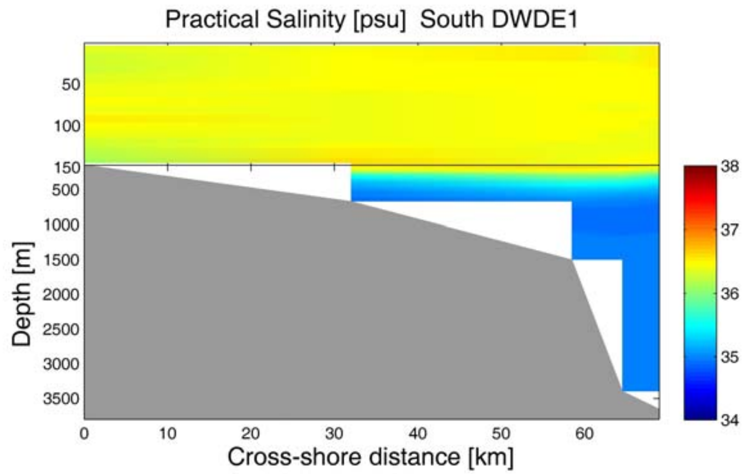

Absolute Salinity [kg/m3] North DWDE1
Depth [m]
Cross-shore distance [km]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
38
37
36
35
34

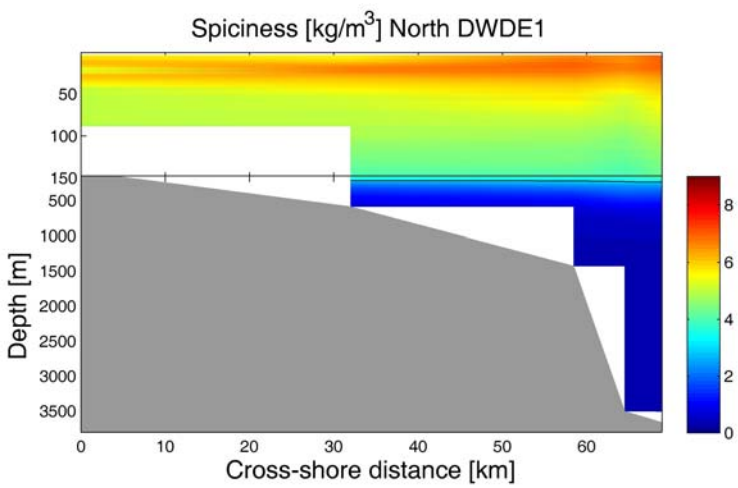

Absolute Salinity [kg/m3] South DWDE1
Depth [m]
Cross-shore distance [km]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
38
37
36
35
34

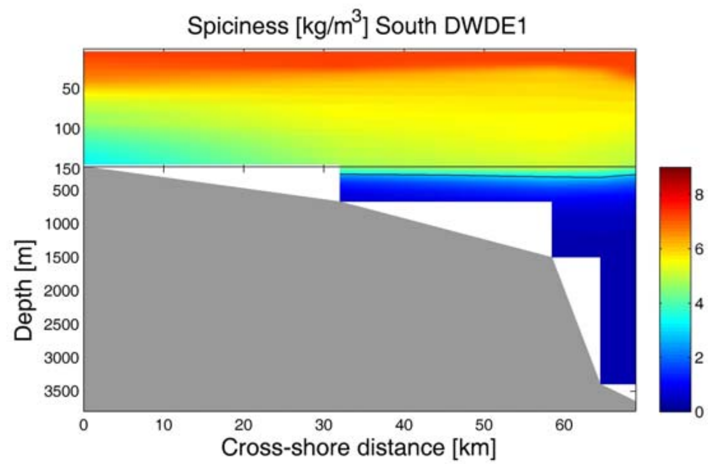

Density anomaly [kg/m3] North DWDE1
Depth [m]
Cross-shore distance [km]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
32
30
28
26
24
22

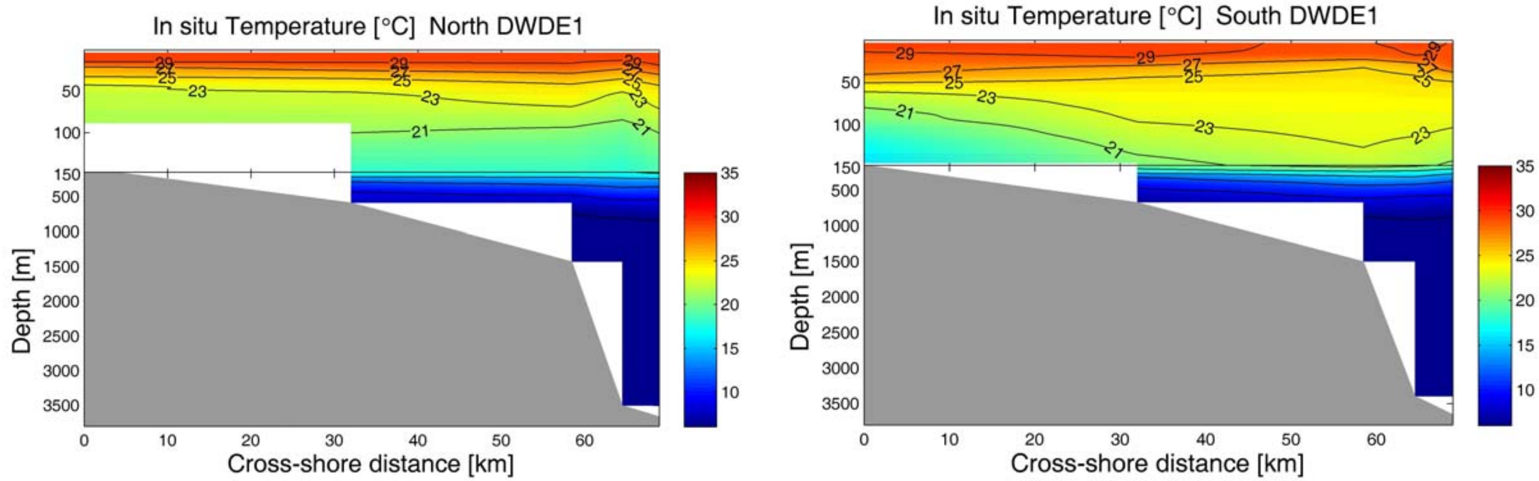

Density anomaly [kg/m3] South DWDE1
Depth [m]
Cross-shore distance [km]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
32
30
28
26
24
22


Practical Salinity [psu] North DWDE1
Depth [m]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
Cross-shore distance [km]
38
37
36
35
34

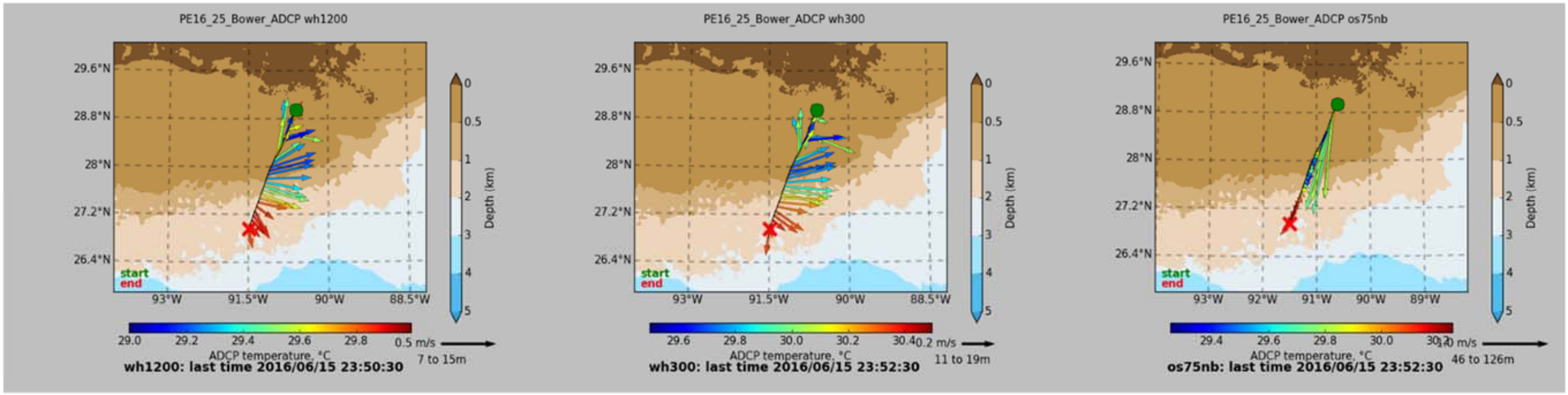

Practical Salinity [psu] South DWDE1
Depth [m]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
Cross-shore distance [km]
38
37
36
35
34

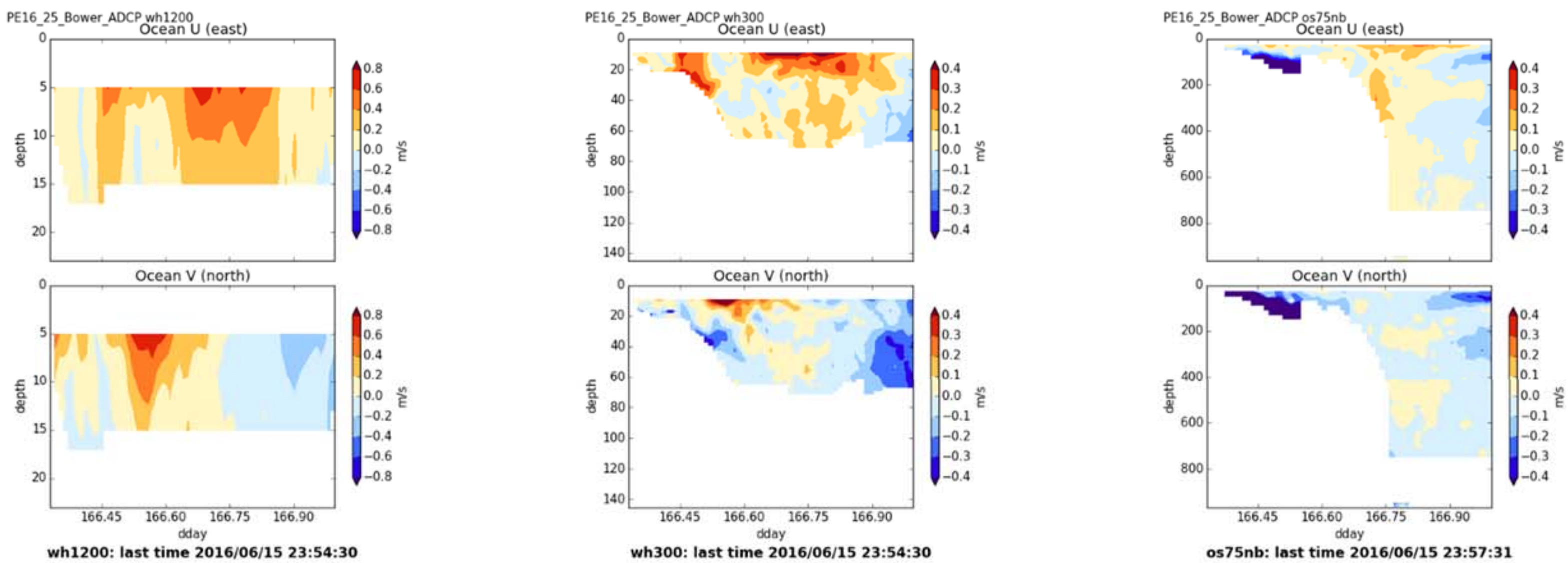

Spiciness [kg/m3] North DWDE1
Depth [m]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
Cross-shore distance [km]
8
6
4
2
0

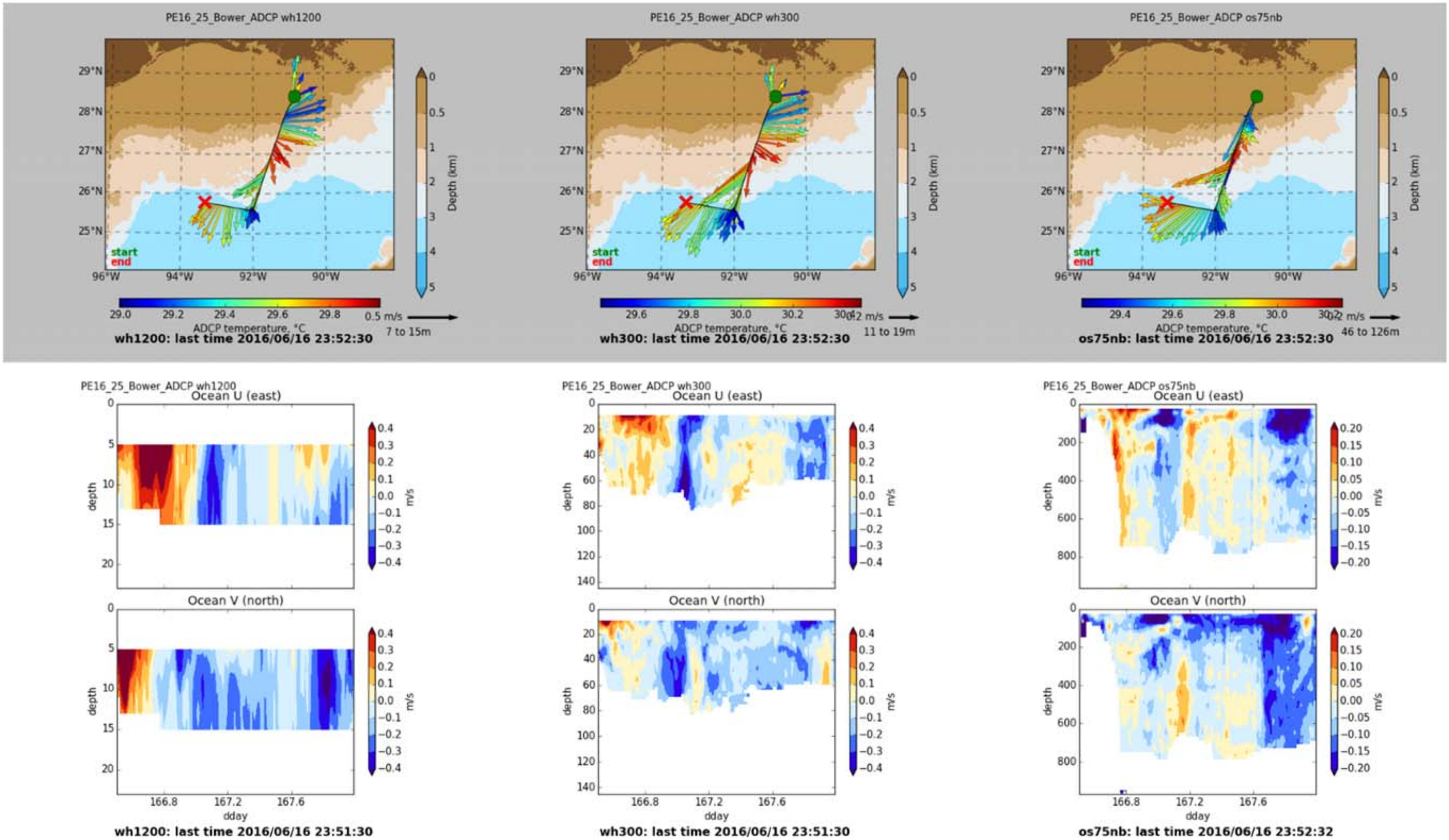

Spiciness [kg/m3] South DWDE1
Depth [m]
50
100
150
500
1000
1500
2000
2500
3000
3500
0
10
20
30
40
50
60
Cross-shore distance [km]
8
6
4
2
0


In situ Temperature [°C] North DWDE1
Depth [m]
Cross-shore distance [km]
In situ Temperature [°C] South DWDE1
Depth [m]
Cross-shore distance [km]

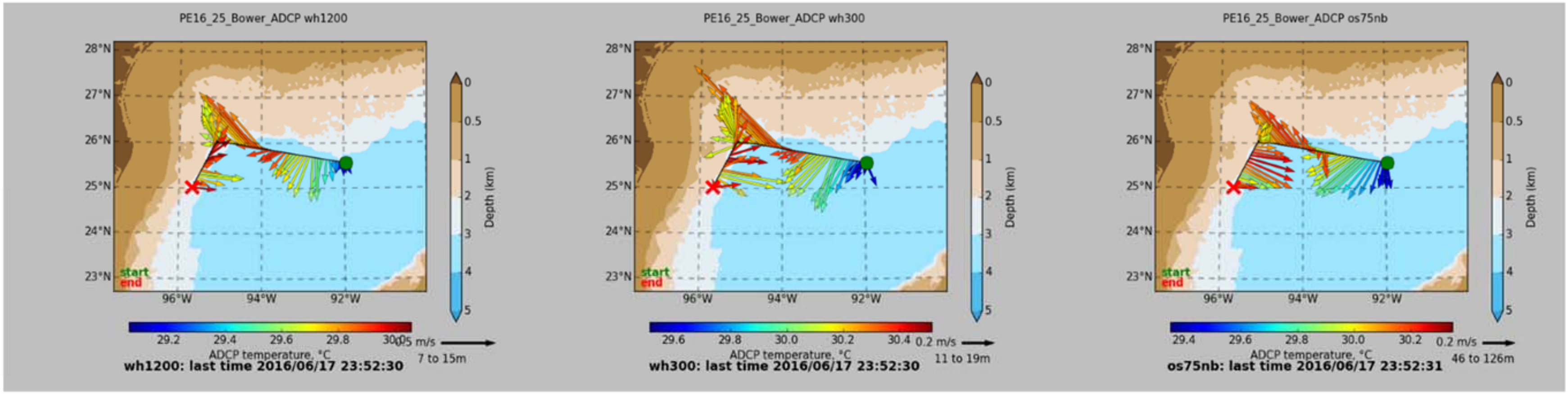
APPENDIX F. ADCP profiles.

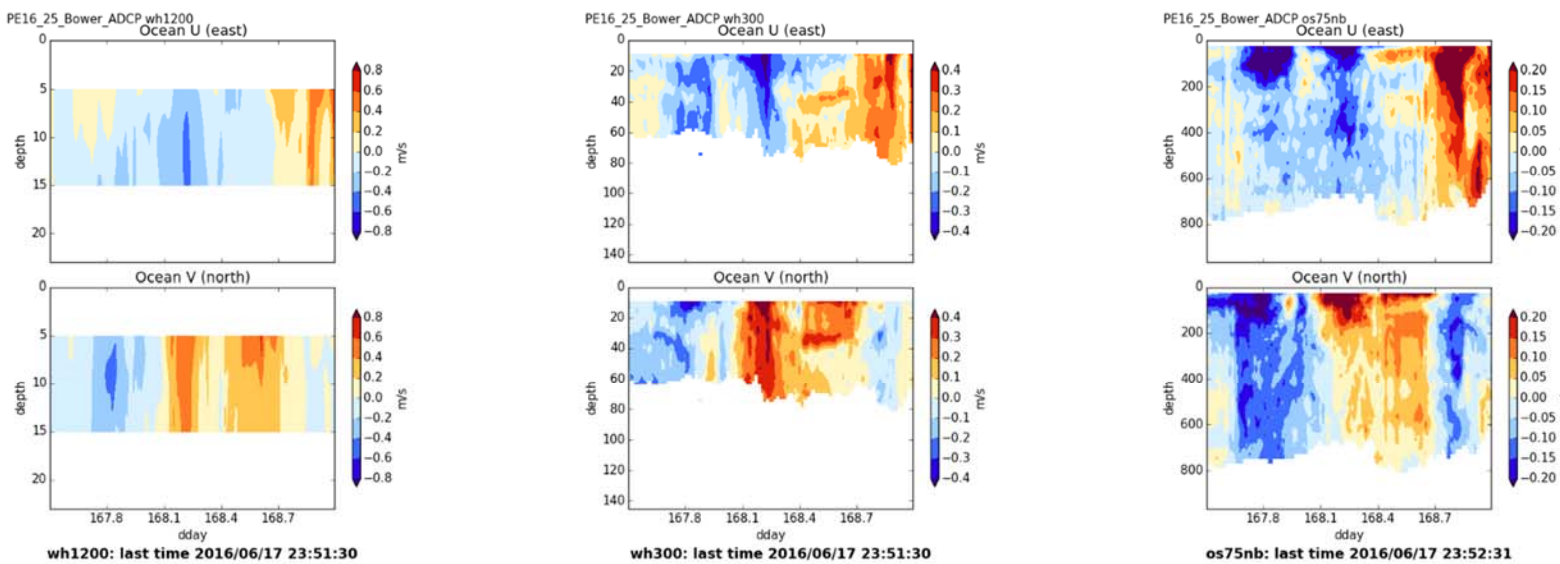


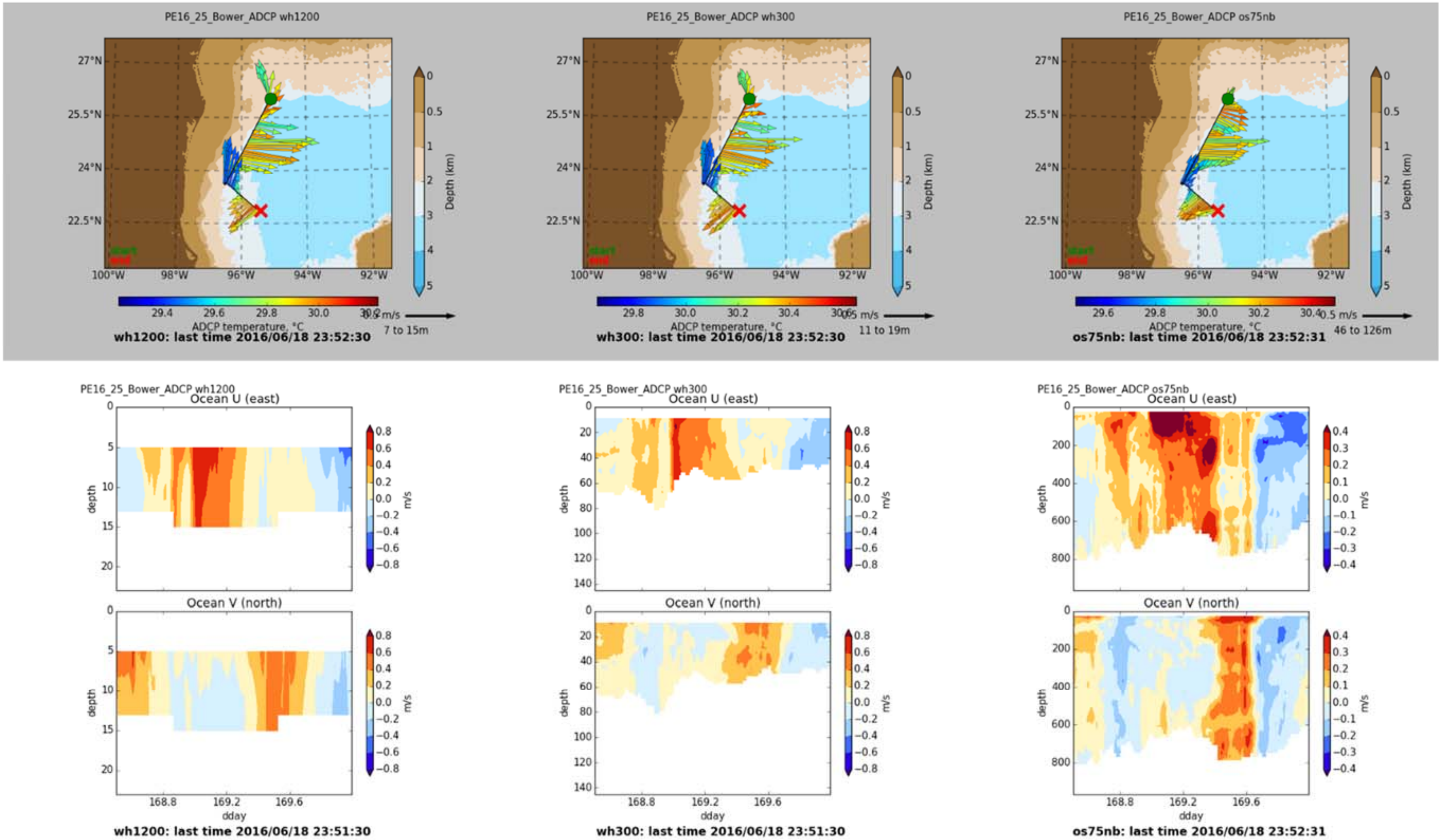


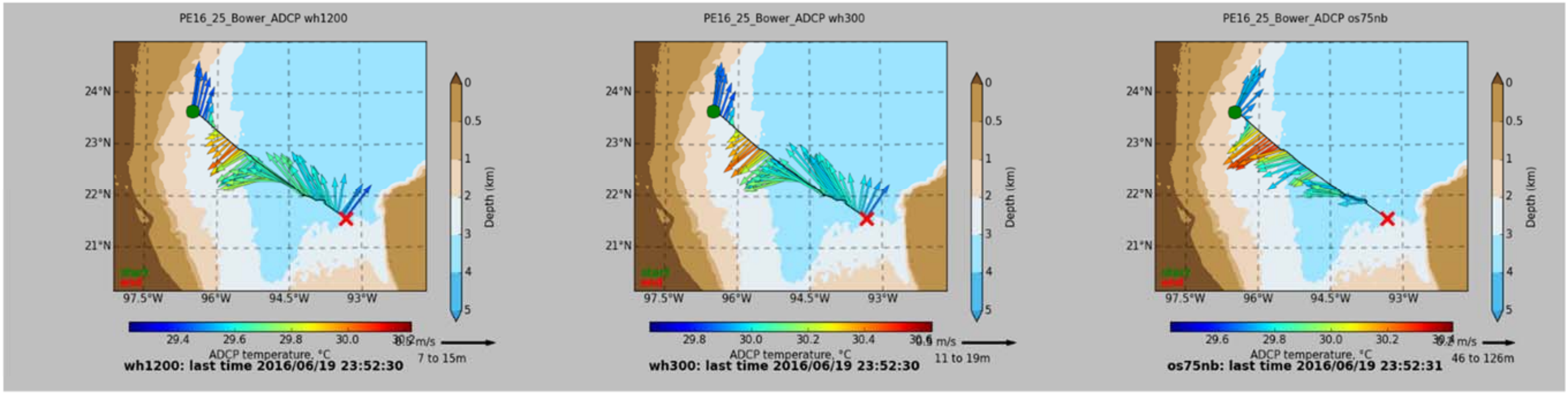


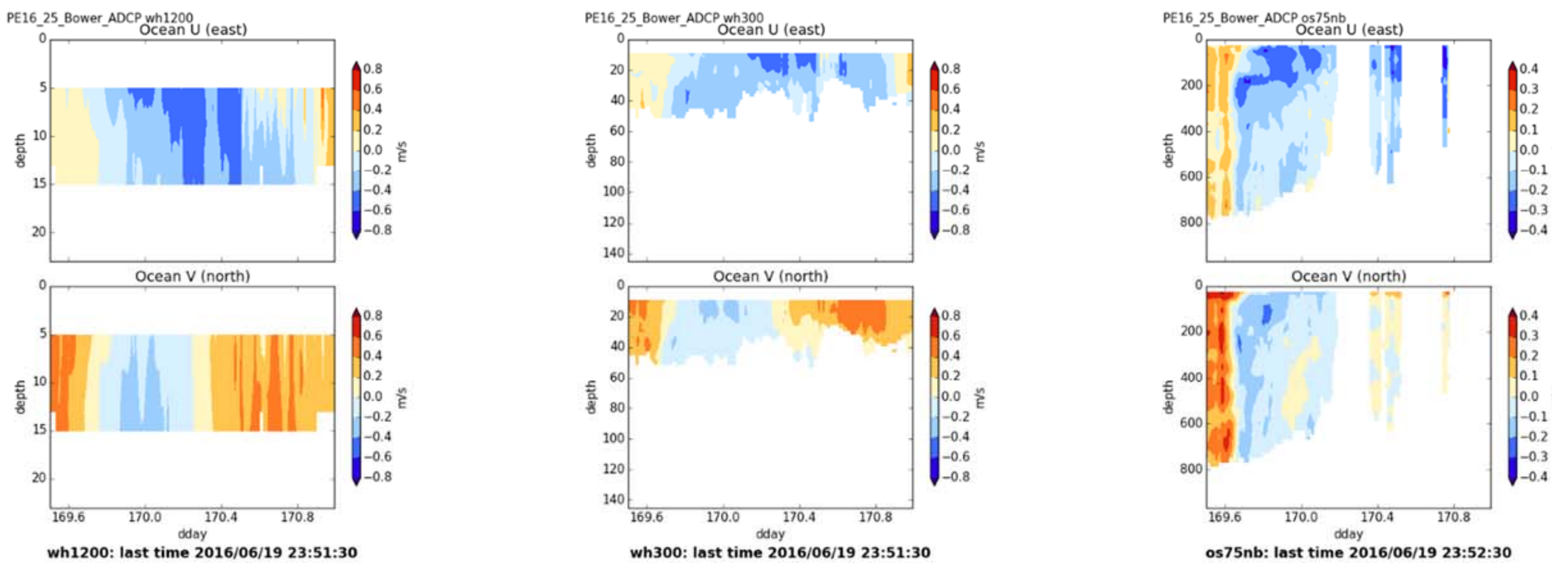
PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
start
end
ADCP temperature, °C
Depth (km)
0.5 m/s
7 to 15m
11 to 19m
46 to 126m
wh1200: last time 2016/06/16 23:52:30
wh300: last time 2016/06/16 23:52:30
os75nb: last time 2016/06/16 23:52:30
Ocean U (east)
Ocean V (north)
depth
dday
m/s
wh1200: last time 2016/06/16 23:51:30
wh300: last time 2016/06/16 23:51:30
os75nb: last time 2016/06/16 23:52:32

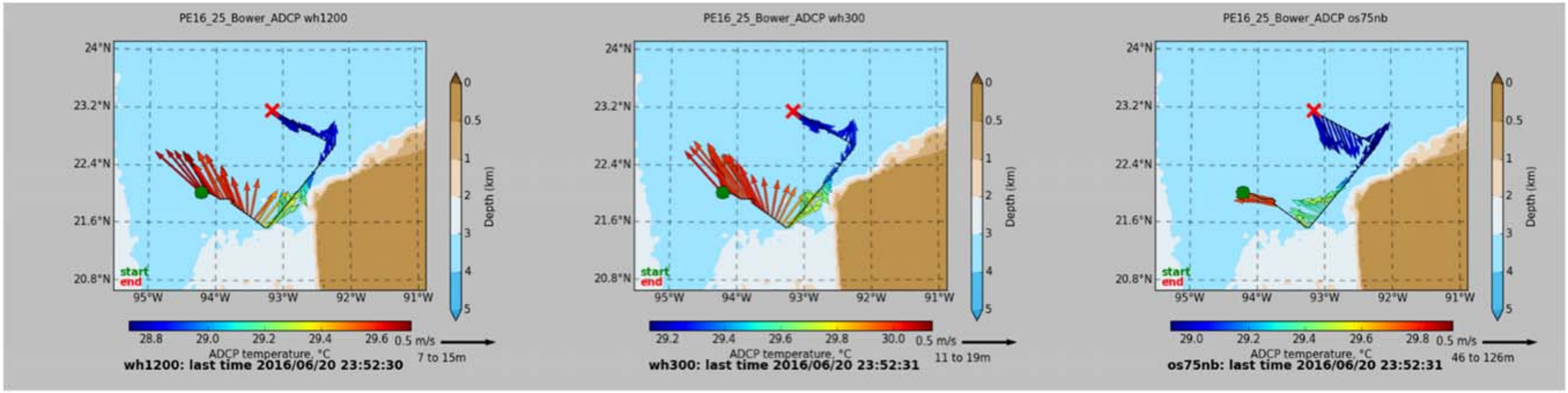

PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
start
end
Depth (km)
ADCP temperature, °C
0.05 m/s
7 to 15m
0.2 m/s
11 to 19m
0.2 m/s
46 to 126m
wh1200: last time 2016/06/17 23:52:30
wh300: last time 2016/06/17 23:52:30
os75nb: last time 2016/06/17 23:52:31

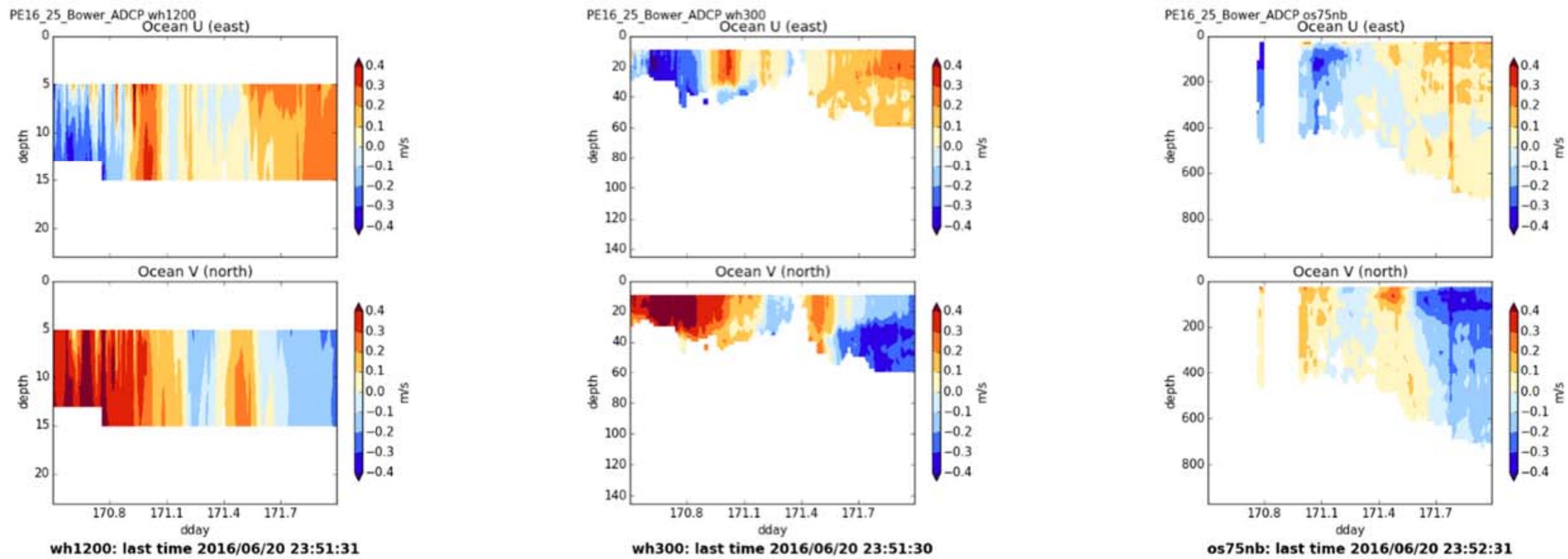

PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Ocean U (east)
Ocean V (north)
depth
m/s
dday
wh1200: last time 2016/06/17 23:51:30
wh300: last time 2016/06/17 23:51:30
os75nb: last time 2016/06/17 23:52:31


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
ADCP temperature, °C
Depth (km)
7 to 15m
11 to 19m
46 to 126m
wh1200: last time 2016/06/18 23:52:30
wh300: last time 2016/06/18 23:52:30
os75nb: last time 2016/06/18 23:52:31
Ocean U (east)
Ocean V (north)
depth
dday
m/s
wh1200: last time 2016/06/18 23:51:30
wh300: last time 2016/06/18 23:51:30
os75nb: last time 2016/06/18 23:52:31


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
24°N
23°N
22°N
21°N
97.5°W
96°W
94.5°W
93°W
Depth (km)
ADCP temperature, °C
0.5 m/s
7 to 15m
11 to 19m
46 to 126m
wh1200: last time 2016/06/19 23:52:30
wh300: last time 2016/06/19 23:52:30
os75nb: last time 2016/06/19 23:52:31


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Ocean U (east)
Ocean V (north)
depth
m/s
dday
wh1200: last time 2016/06/19 23:51:30
wh300: last time 2016/06/19 23:51:30
os75nb: last time 2016/06/19 23:52:30


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
start
end
Depth (km)
ADCP temperature, °C
0.5 m/s
7 to 15m
11 to 19m
46 to 126m
wh1200: last time 2016/06/20 23:52:30
wh300: last time 2016/06/20 23:52:31
os75nb: last time 2016/06/20 23:52:31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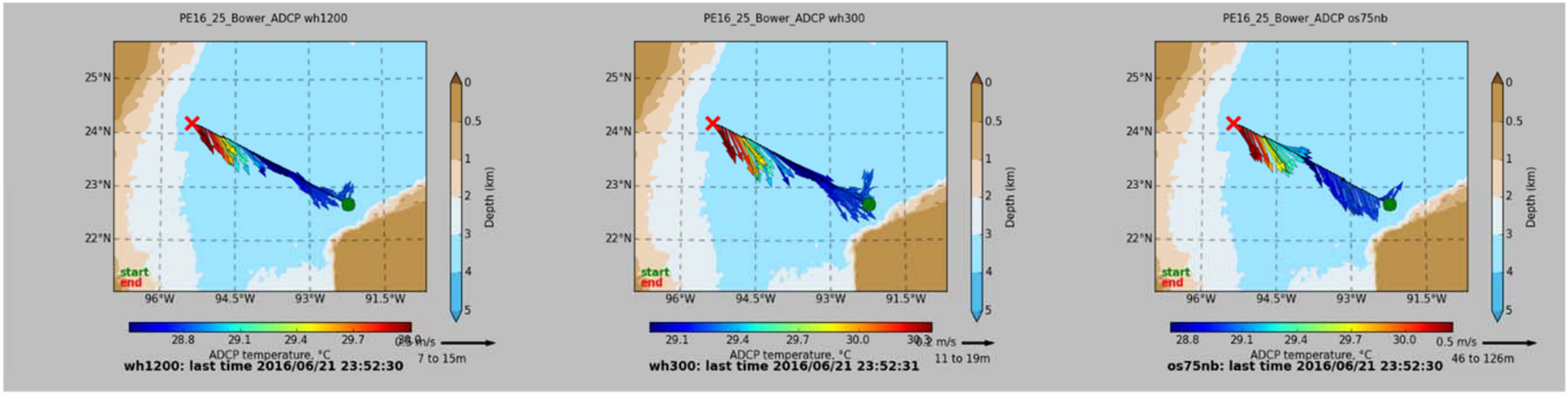
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Ocean U (east)
Ocean V (north)
depth
dday
m/s
wh1200: last time 2016/06/20 23:51:31
wh300: last time 2016/06/20 23:51:30
os75nb: last time 2016/06/20 23:52:31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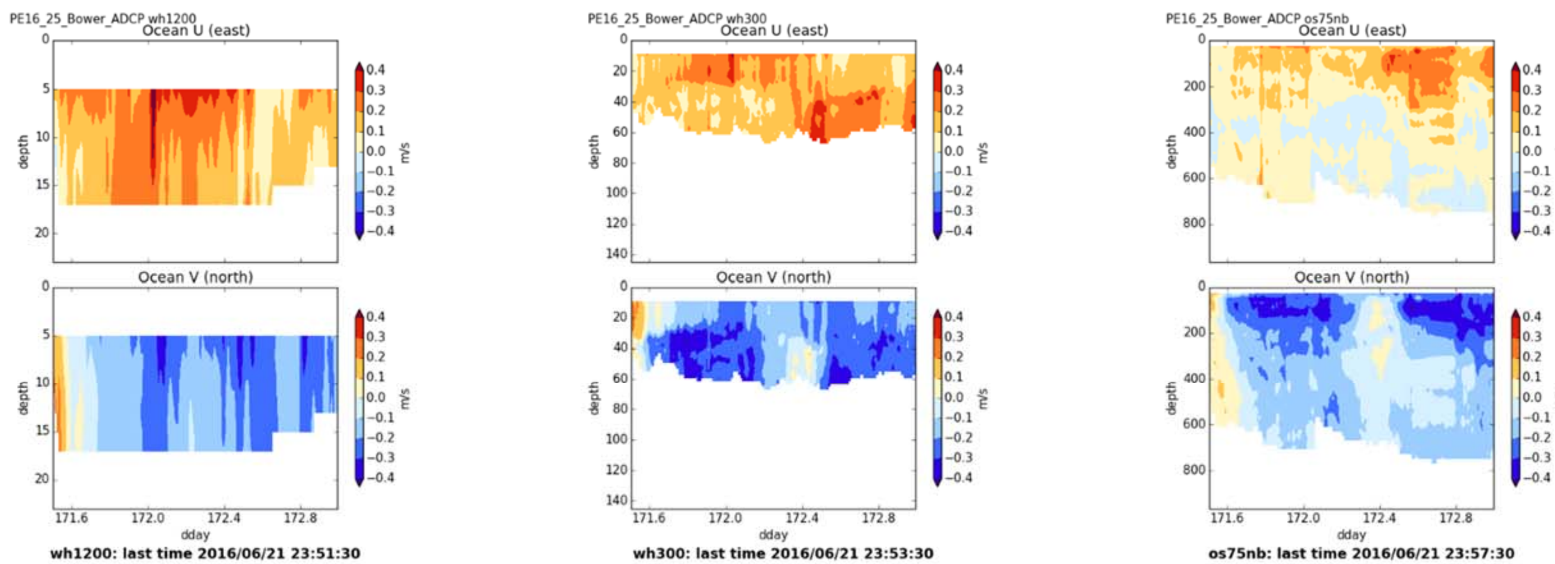
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
start
end
Depth (km)
ADCP temperature, °C
7 to 15m
11 to 19m
0.5 m/s
46 to 126m
wh1200: last time 2016/06/21 23:52:30
wh300: last time 2016/06/21 23:52:31
os75nb: last time 2016/06/21 23:52:30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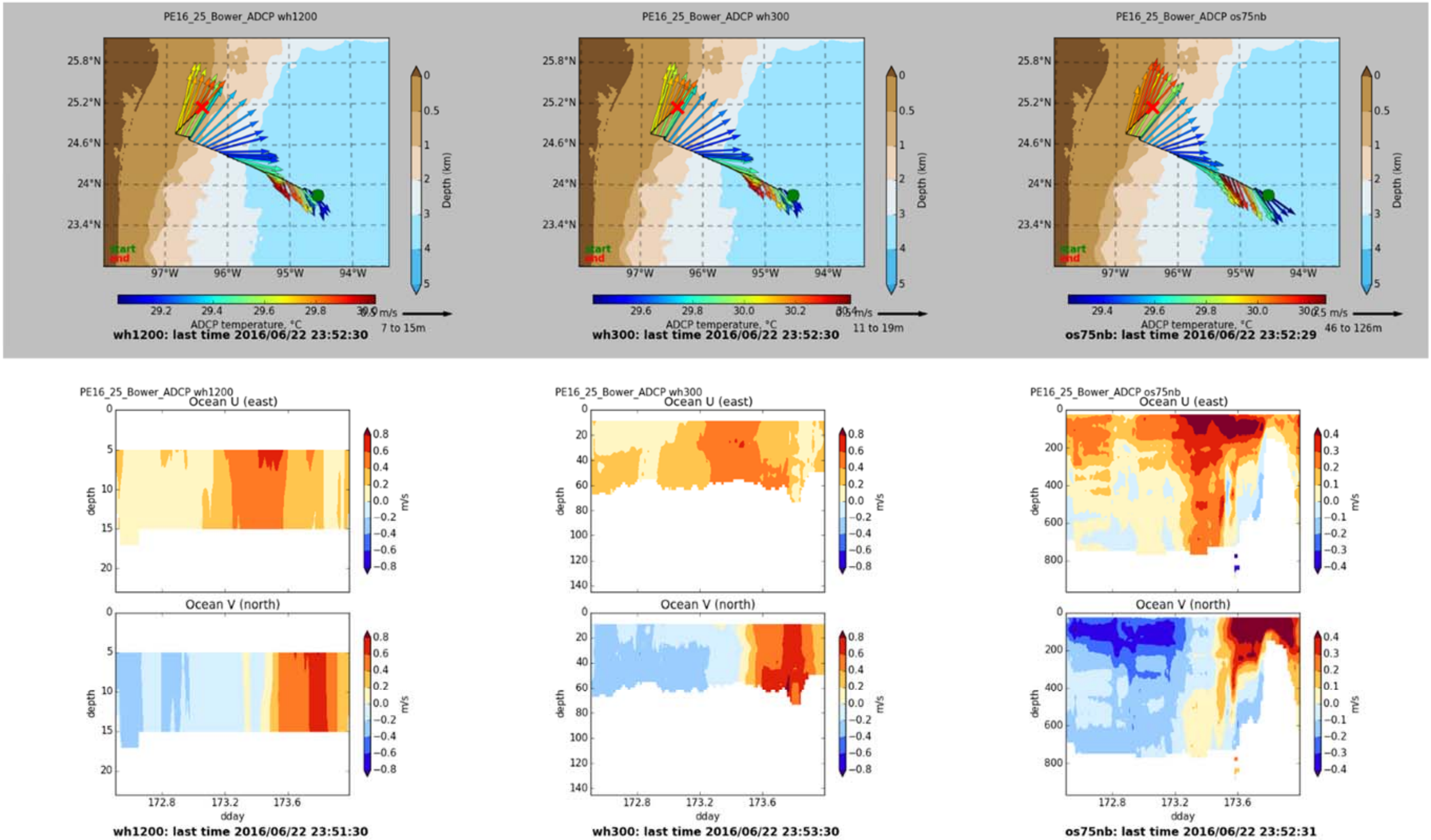
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Ocean U (east)
Ocean V (north)
depth
m/s
dday
wh1200: last time 2016/06/21 23:51:30
wh300: last time 2016/06/21 23:53:30
os75nb: last time 2016/06/21 23:57:30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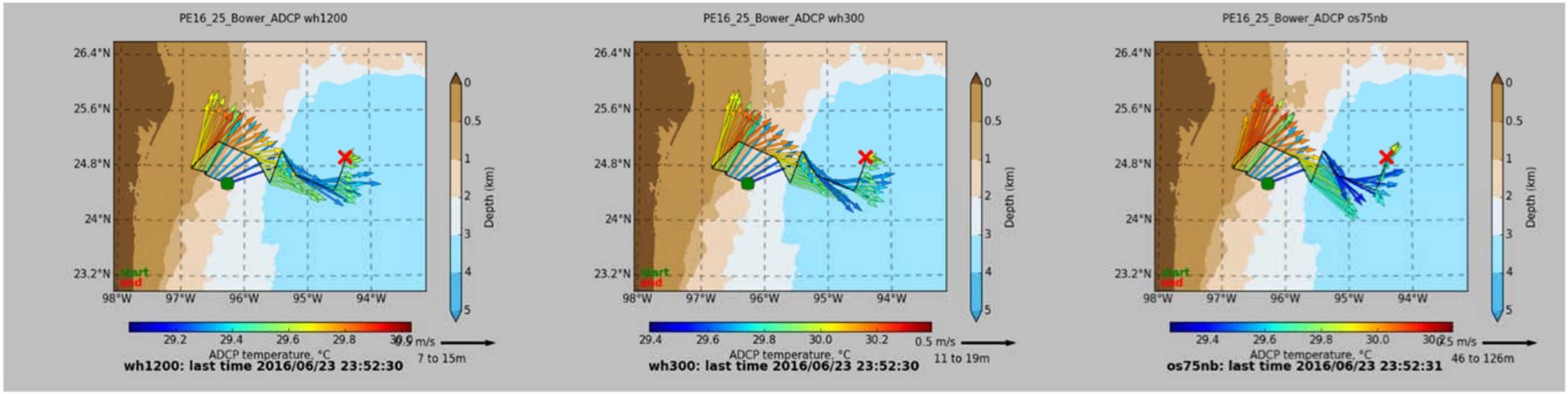
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
ADCP temperature, °C
Depth (km)
7 to 15m
11 to 19m
46 to 126m
wh1200: last time 2016/06/22 23:52:30
wh300: last time 2016/06/22 23:52:30
os75nb: last time 2016/06/22 23:52:29
Ocean U (east)
Ocean V (north)
depth
dday
m/s
wh1200: last time 2016/06/22 23:51:30
wh300: last time 2016/06/22 23:53:30
os75nb: last time 2016/06/22 23:52:31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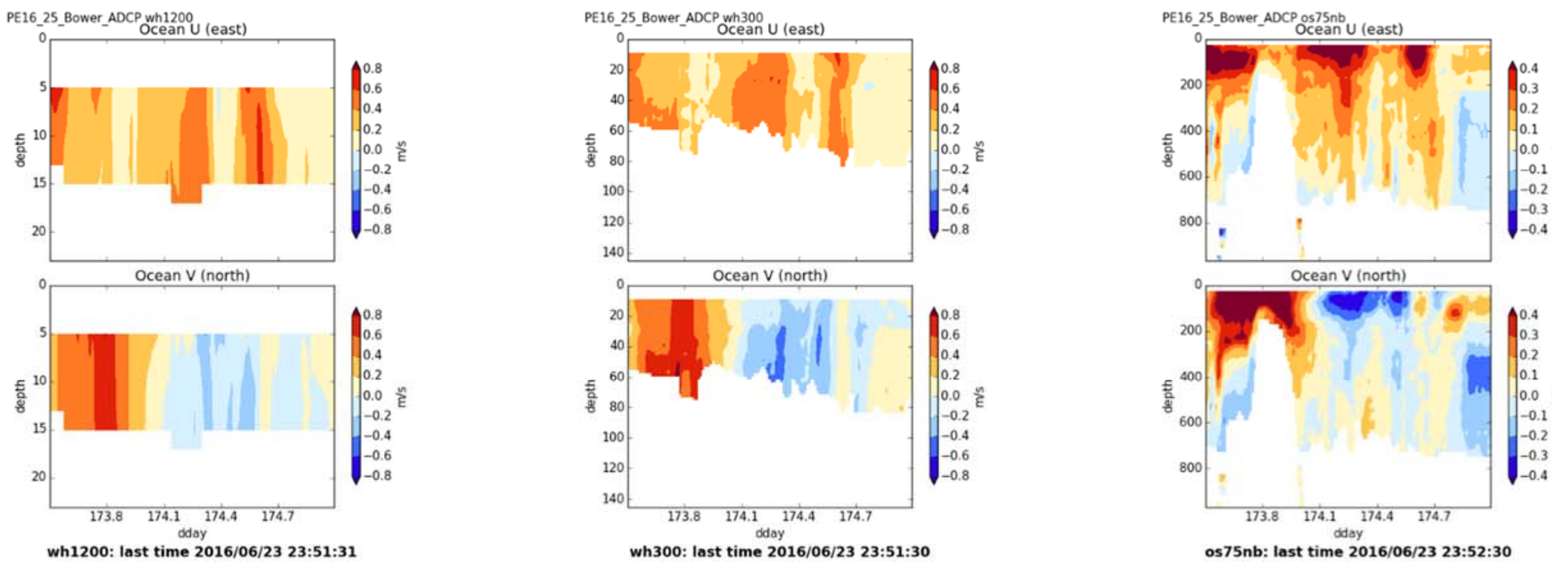
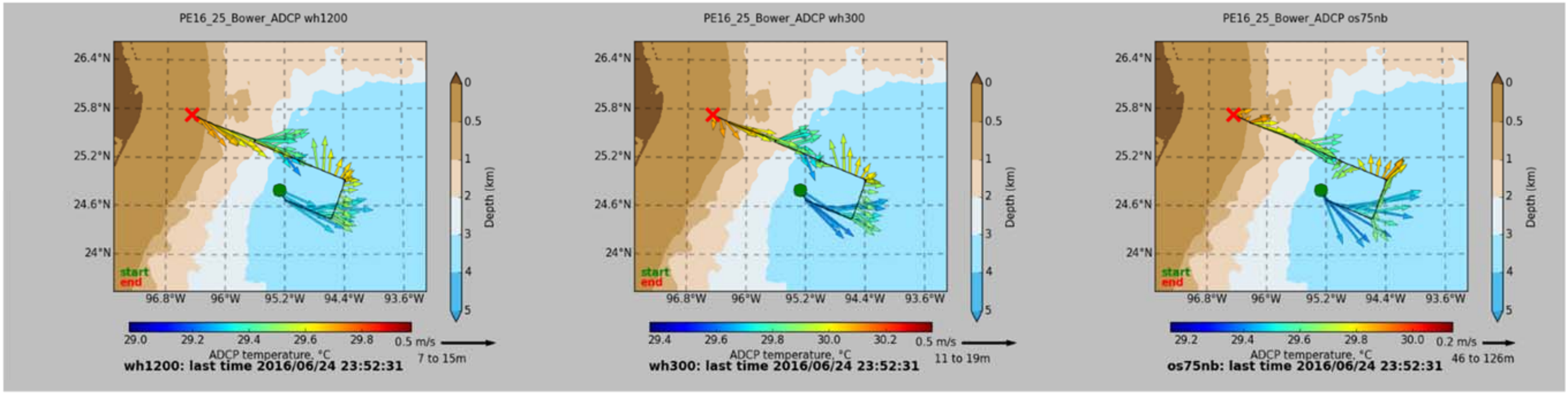
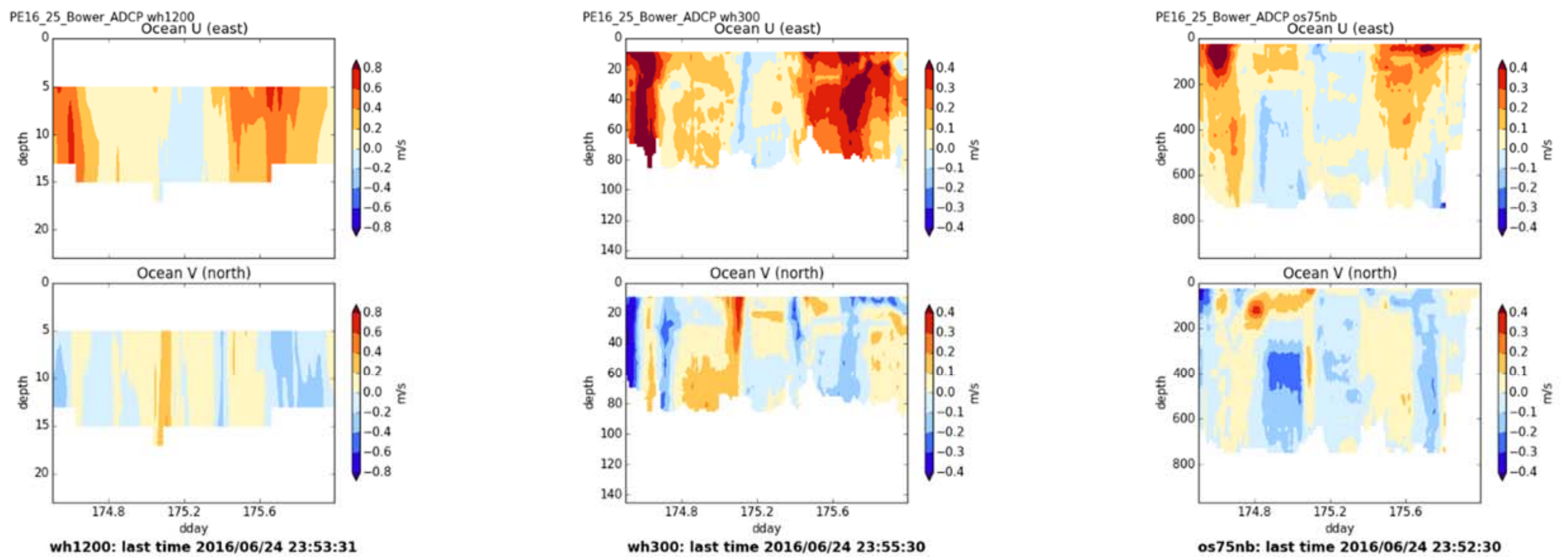
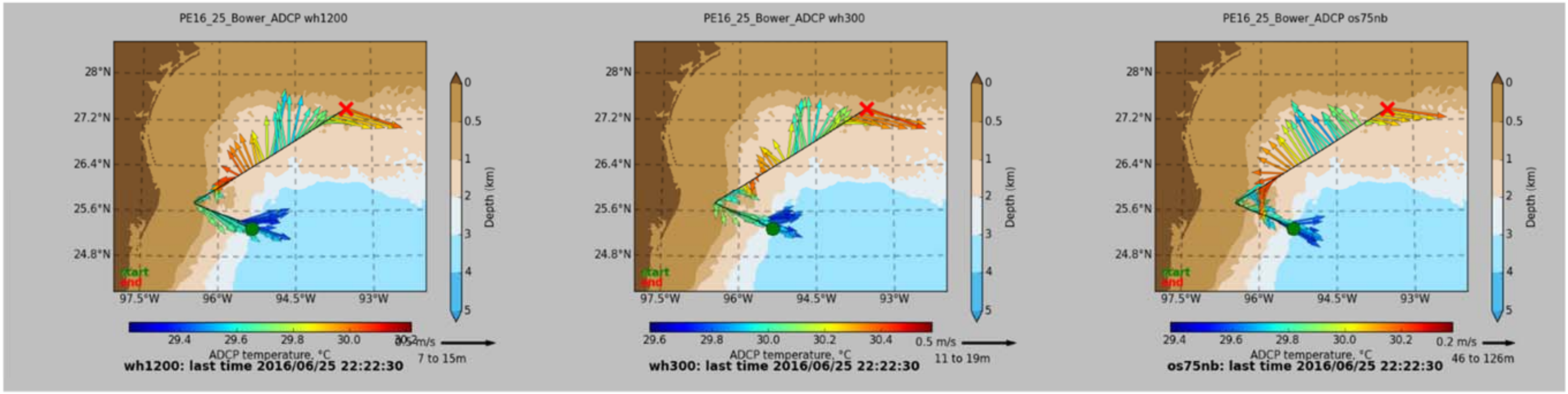
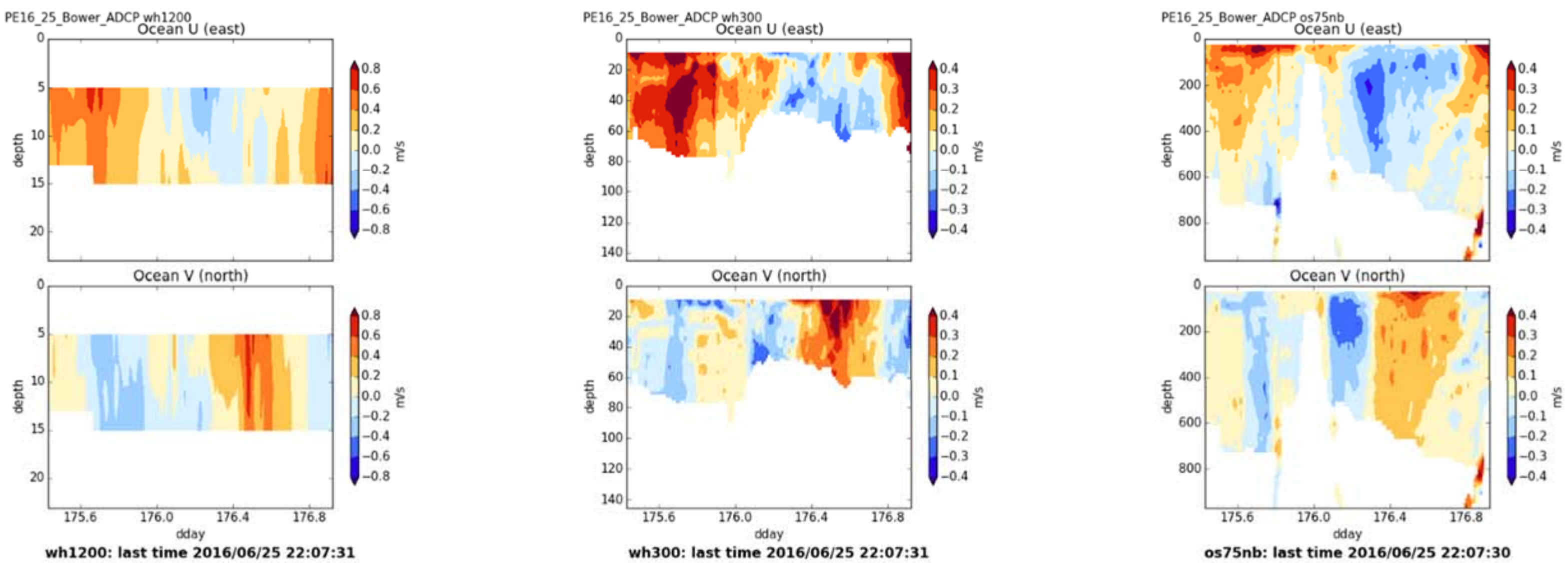
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
ADCP temperature, °C
Depth (km)
0.5 m/s
7 to 15m
11 to 19m
46 to 126m
start
end
wh1200: last time 2016/06/23 23:52:30
wh300: last time 2016/06/23 23:52:30
os75nb: last time 2016/06/23 23:52:31


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Ocean U (east)
Ocean V (north)
depth
dday
m/s
wh1200: last time 2016/06/23 23:51:31
wh300: last time 2016/06/23 23:51:30
os75nb: last time 2016/06/23 23:52:30


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Depth (km)
start
end
ADCP temperature, °C
0.5 m/s
7 to 15m
11 to 19m
0.2 m/s
46 to 126m
wh1200: last time 2016/06/24 23:52:31
wh300: last time 2016/06/24 23:52:31
os75nb: last time 2016/06/24 23:52:31


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Ocean U (east)
Ocean V (north)
depth
m/s
dday
wh1200: last time 2016/06/24 23:53:31
wh300: last time 2016/06/24 23:55:30
os75nb: last time 2016/06/24 23:52:30


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Depth (km)
ADCP temperature, °C
7 to 15m
11 to 19m
46 to 126m
wh1200: last time 2016/06/25 22:22:30
wh300: last time 2016/06/25 22:22:30
os75nb: last time 2016/06/25 22:22:30


PE16_25_Bower_ADCP wh1200
PE16_25_Bower_ADCP wh300
PE16_25_Bower_ADCP os75nb
Ocean U (east)
Ocean V (north)
depth
dday
m/s
wh1200: last time 2016/06/25 22:07:31
wh300: last time 2016/06/25 22:07:31
os75nb: last time 2016/06/25 22:07:30

CIGoM

Consorcio de Investigación del Golfo de México

Este estudio es parte del proyecto 201441
"Implementación de redes de observación oceanográficas (físicas, geo-químicas, ecológicas) para la generación de escenarios ante posibles contingencias relacionadas a la exploración y producción de hidrocarburos en aguas profundas del Golfo de México"
financiado por el Fondo Sectorial
CONACYT-SENER-Hidrocarburos

Esta es una contribución del
Consorcio de Investigación del Golfo de México

SENER
SECRETARÍA DE ENERGÍA

CONACYT