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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-3.

2 Stations

DWDE-3 campaign consisted of 25 stations where biological, chemical and physical samples were collected, CTD casts were measured and where drifters and ARGO floats were released, Figure 1: Stations DWDEFigure 1.

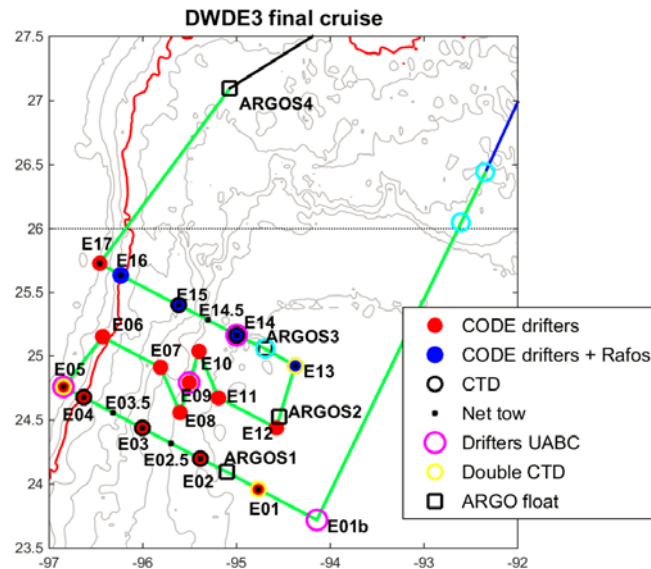


Figure 1: Stations DWDE-3

The surface circulation pattern (April 25th) and ship trajectory are shown in Figure 2. Particularly of interest is the large dipole centered at (-95gradosW, 26gradosE) and formed by one large cyclone in the north and a large deformed anticyclone in the south. Both eddies were measured by the three ship mounted ADCPs but only the large anticyclone was sampled by the CTD casts.

The Figure 3 shows the vorticity (vort) and Kinetic Energy (KE) field derived from AVISO. Some interesting features are the high KE signal associated to all detected eddies and the jet formed at the center of the dipole, and the high (negative) positive vorticity patches in (anti) cyclones, and Loop Current Frontal Eddies (LCFE).

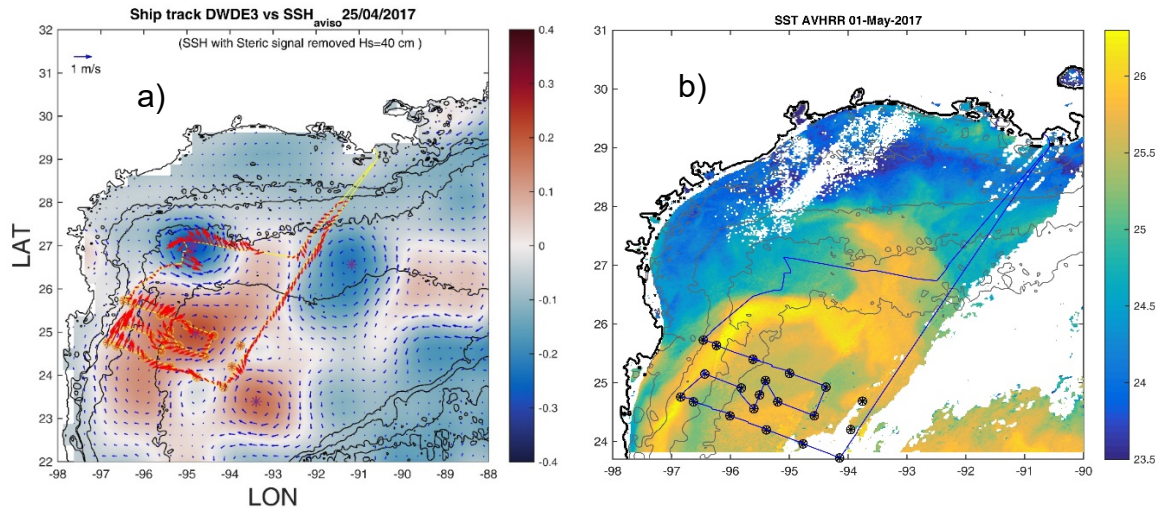


Figure 2. a) Sea surface circulation pattern for the 25th of April and ship path. The map shows a large cyclone-anticyclone dipole in the west, and several other mesoscale structures. The ADCP velocities are shown along the ship track for comparison. b) SST from AVHRR for 1st of May.

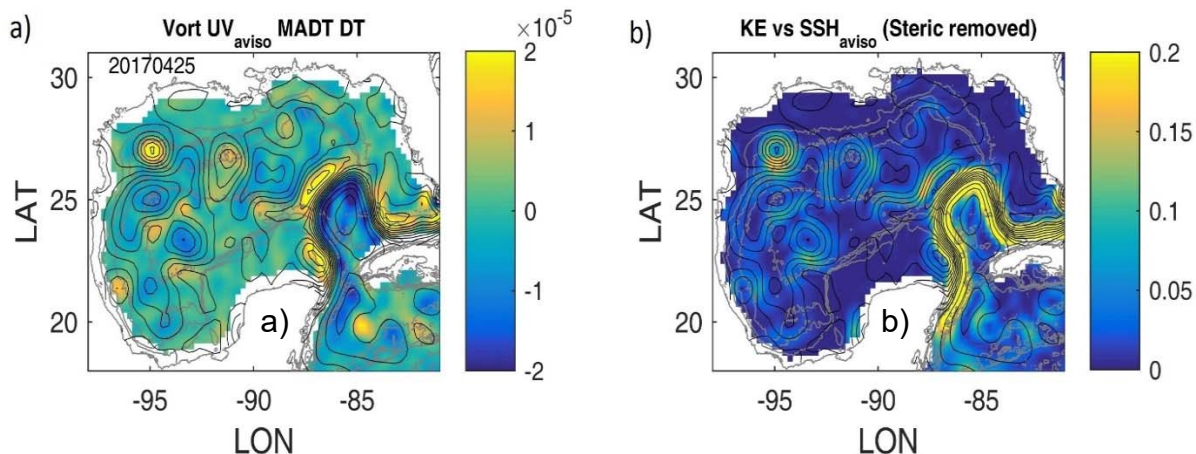


Figure 3: Vorticity and Kinetic Energy GoM. Loop current dominates the Kinetic Energy and vorticity signals, but the other mesoscale eddies are visible.

3 DESCRIPTION OF DATA

3.1 General

This report describes the data acquired during the DWDE-3 cruise in the region of Perdido in the Gulf of Mexico from April 22nd to May 1st, 2017, on board the R/V Pelican. A total of 11 CTD casts were collected in two cross-shelf transects: north (E13-E15) and south (E1-E5 stations) see Figure 1. Unfortunately, the CTD Rossette was lost during the 11th cast and the North section was not completely measured.

3.1.1 CTD instrument

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

| 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 | 3/15/2017, 03/15/2017 |
| Pressure: Paroscientific Digiquartz | 0-10350 dbar | 0.015% of full scale | 0.001% of full scale | 1/19/2017 |
| Temperature: SBE03 (x2) | -5.0 - +35 °C | ± 0.001 °C | 0.0003 °C | 12/10/2016, 11/10/2016 |
| Oxygen: SBE43 (x2) | 120% of surface saturation | ± 2% of saturation | N/A | 3/15/2017, 11/10/2016 |
| 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 (x2) 3 | Hydrocarbon (refined): 0.001-10 µg/L, Hydrocarbon (crude): 0.001-10 µg/L, CDOM: 0.001-10 µg/L | ± 0.02 µg/l or 3% whichever the greater | Hydrocarbon (refined): 0.001 µg/L, Hydrocarbon (crude): 0.001 µg/L, CDOM: 0.001 µg/L | 12/1/2015, 02/23/2016 |

| | | | | |
|---|--|-----|---|------------|
| Fluorometer Chelsea Aqua 3 | Chl-a: 0.01-100 µg/L, Rhodamine: 0.01-100 µg/L, Fluorescein: 0.01-100 µg/L, Turbidity: 0.01-100 FTU | N/A | Chl-a: 0.01 µg/L, Rhodamine: 0.01 µg/L, Fluorescein: 0.01 µg/L, Turbidity: 0.01 FTU | 12/21/2016 |
| Beam Transmission: transmissiometer Wetlabs C-Star | 0-100% | N/A | N/A | 11/23/2016 |

Table 1: CTD sensor specifications and calibration dates.

The CTD was equipped with the standard sensors: temperature(x2), conductivity (x2) (salinity) and pressure (depth). In addition, four backscatter fluorometers were installed to determine the distribution of hydrocarbons, chlorophyll and natural chromophoric dissolved organic matter (CDOM). The CDOM sensor, from WetLabs, with an excitation/emission setting of 370nm/460nm, two hydrocarbon Aquatracka UV sensors from Chelsea Technologies with an excitation/emission setting of 239nm/360nm and finally, an Aquatracka 3 Chlorophyll-a sensor also from Chelsea Technologies. The CTD was also equipped with two oxygen sensors. All the sensors were deployed at all hydrographic stations. Specifications for the CTD sensors are given in Table 1.

Similar to DWDE-2, during the DWDE-3 cruise the quality of Chelsea UV Aquatracka hydrocarbon sensor from Dr. Rainer Amon was tested against a similar instrument. The findings suggest, again, that both sensors were not measuring equally, and the measurements with this type of sensor are unreliable if the aim is to compare different campaigns.

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 DWDE-2.

| 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 | 08/09/16 |
| Beam Transmission: transmissometer Wetlabs C-Star 25 cm path length | 0-100% | N/A | N/A | 01/09/2017 field calibration: 02-02-2017 |

3.1.3 ADCPs

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

The ADCP Workhorse 1200 Khz resolves the surface with high detail. 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.

As stated before, 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.

At the end of the cruise, around the 29th of April, the ship experienced a period of high wind/waves due to pass of a “norte”. This resulted in periods of data loss due to the ships’ movement (see Figure 4). The gap is also visible in the WH1200KHz and WH300KHz (not shown here).

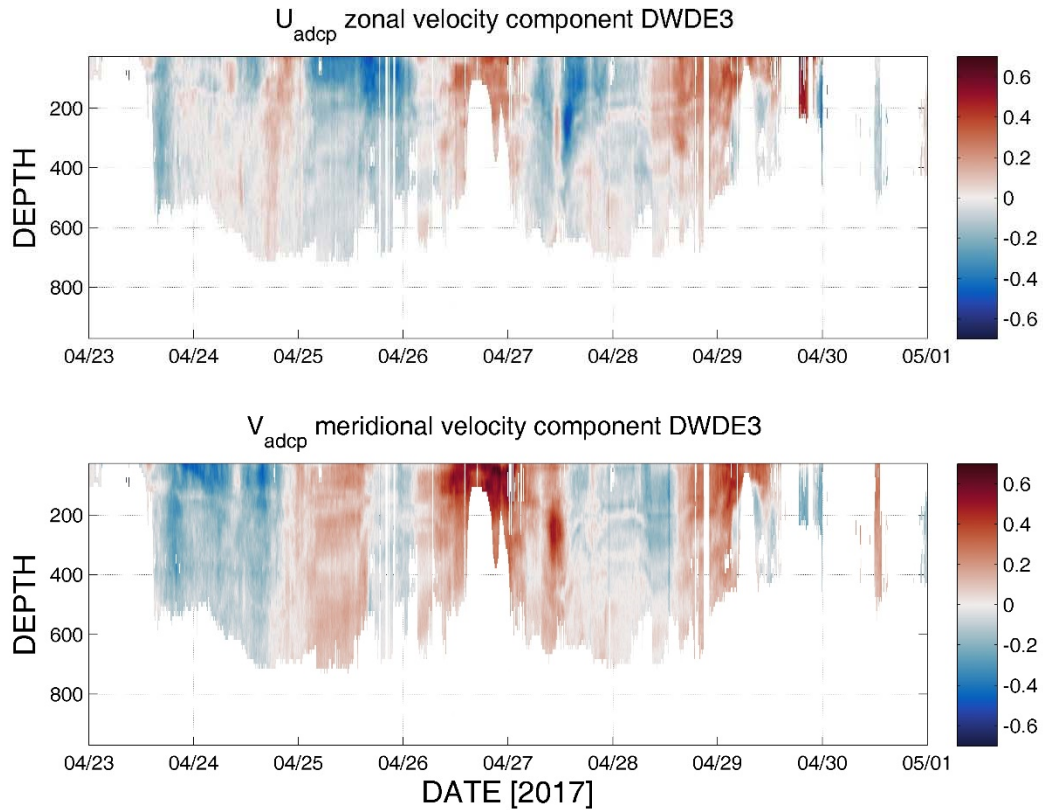


Figure 4: Zonal and Longitudinal velocities measured by the 75 kHz ADCP during the DWDE-3 cruise. The gap at the end was caused by bad weather during the cruise.

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 7.26.6.26.

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 DWDE3 campaign.

| VAR. NAME | VARIABLE MEASURED | UNITS |
|-------------------|--|---------------------|
| prDM | Pressure, Digiquartz | dBar |
| Pumps | Pump Status | on(1)/off(0) |
| t090C | Temperature (ITS-90) | °C |
| t190C | Temperature, 2 (ITS-90) | °C |
| timeS | Time, Elapsed | Seconds |
| Spar | SPAR/Surface Irradiance | microEinsteins/m2/s |
| 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 |
| fiCUVA | Fluorescence, Chelsea UV Aquatracka | ug/l |
| fiCUVA1 | Fluorescence, Chelsea UV Aquatracka | ug/l |
| fiC | Fluorescence, Chelsea 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 |

- 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.
- The module **Filter** is used to low-pass filter the salinity and pressure with constants A=0.03 and B=0.15 seconds, respectively.
- 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.
- The last stage of the Seabird processing is to apply **Celltm** module. This step applies cell thermal mass correction for the lag in the response of temperature sensor.

6. 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 seven-step process 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, fICUVA, fIC, and CStarTr0 variables. In some occasions the lack of synchronization between sensors and the data acquisition system results in wrong recorded values. These values can be detected as jumps in the data that have a fixed value (e.g. 0). These 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 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. 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 of 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. Bin average of the data is performed in order to obtain data every 1 dBar.
7. 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.
8. Data is saved as CSV files ready to be used.

The final data results 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 of 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 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 the ship's thermosalinograph were extracted from the 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 5 shows Temperature, Salinity and Fluorescence along the ship track measured by the thermosalinograph. A cyclonic eddy located approximately at (-95°W,27°N) is detected in T, S and Chl-a. It shows low values in temperature and salinity, and high values in Chl-a. Low temperature, low salinity and high chlorophyll in that eddy could be related with the presence of riverine water. SST image from AVHRR in Figure 2.b shows a high temperature ($T > 26^{\circ}\text{C}$) front around the anticyclonic eddy that is colliding with the shelf on the west, it suggests transport of water from the southern GoM by the anticyclone-cyclone dipole. The front was sampled by the thermosalinograph when the ship was traveling near the shallowest stations (see Figure 5). Also in Figure 2.b the cyclone appears as a blob of “cold” water ($T \sim 25^{\circ}\text{C}$) north of the front, around 27°N.

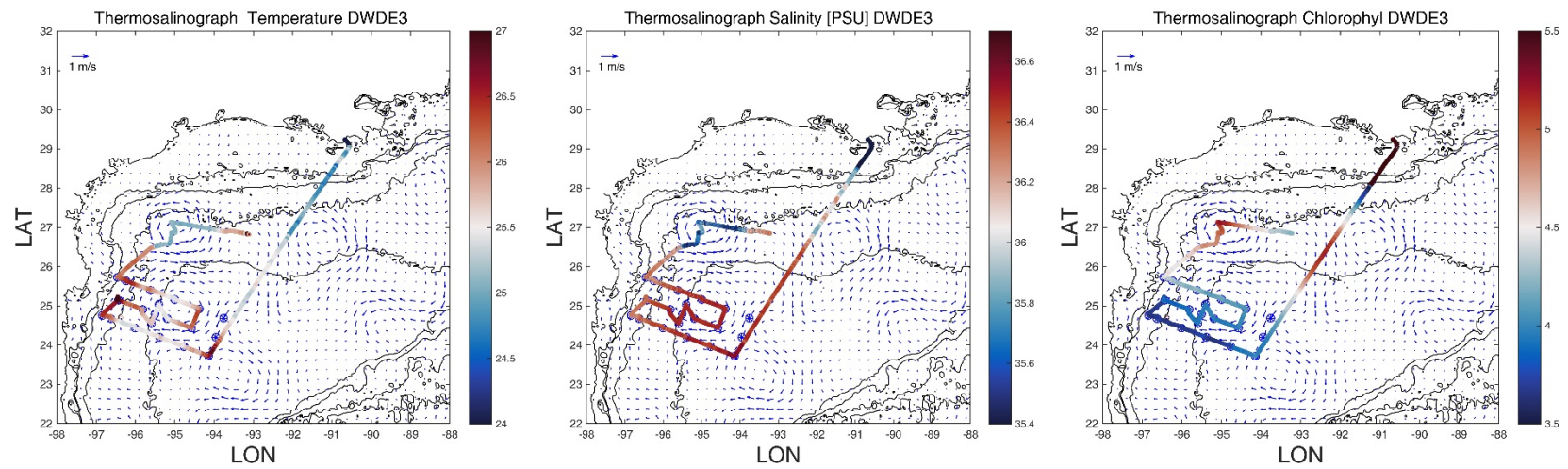


Figure 5: Temperature, Salinity and Chlorophyll-a measured along ship path during DWDE-3 cruise.

5 CTD casts transects

The transect casts were collected along 2 cross-shelf sections: South and North. South section consisted of five stations and 7 casts and due to the loss of the CTD-Rossette the North section only consisted of three stations and 4 casts.

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

Table 4: CTD cast's information for DWDE2 cruise.

| DAY | SECTION | STATION | CAST # | DEPTH (m) Bottom/Cast | Lat | Long |
|------------|---------|---------|--------|--------------------------|--------------|--------------|
| 04/25/2017 | South | E1 | 1 | 3695/3600 | 23° 57.582 N | 94° 45.912 W |
| 04/25/2017 | South | E1 | 2 | 3698/3600 | 23° 57.569 N | 94° 45.927 W |
| 04/25/2017 | South | E2 | 3 | 3448/3100 | 24° 12.011 N | 95° 23.326 W |
| 04/26/2017 | South | E3 | 4 | 2502/2400 | 24° 26.315 N | 96° 00.494 W |
| 04/26/2017 | South | E4 | 5 | 673/650 | 24° 40.816 N | 96° 37.812 W |
| 04/26/2017 | South | E5 | 6 | 155/150 | 24° 45.669 N | 96° 50.651 W |
| 04/26/2017 | South | E5 | 7 | 155/24 | 24° 45.528 N | 96° 50.593 W |
| 04/27/2017 | North | E13 | 8 | 3690/3600 | 24° 55.341 N | 94° 22.665 W |

| | | | | | | |
|-----------|-------|-----|----|-----------|----------|----------|
| 04/27/201 | | E13 | 9 | | 24° | 94° |
| 7 | North | | | 3681/1200 | 57.493 N | 24.907 W |
| 04/28/201 | | E14 | 10 | | 25° | 94° |
| 7 | North | | | 3529/2500 | 09.790 N | 59.793 W |
| 04/28/201 | | E15 | 11 | | 25° | 95° |
| 7 | North | | | 3455 | 24.069 N | 37.002 W |

As presented in the DWDE1 report, results will be shown 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 6. The figure also shows iso-contours of potential density anomaly and spiciness. Dissolved oxygen (in color shows deep waters ($d > 1000$ m) having large concentrations.

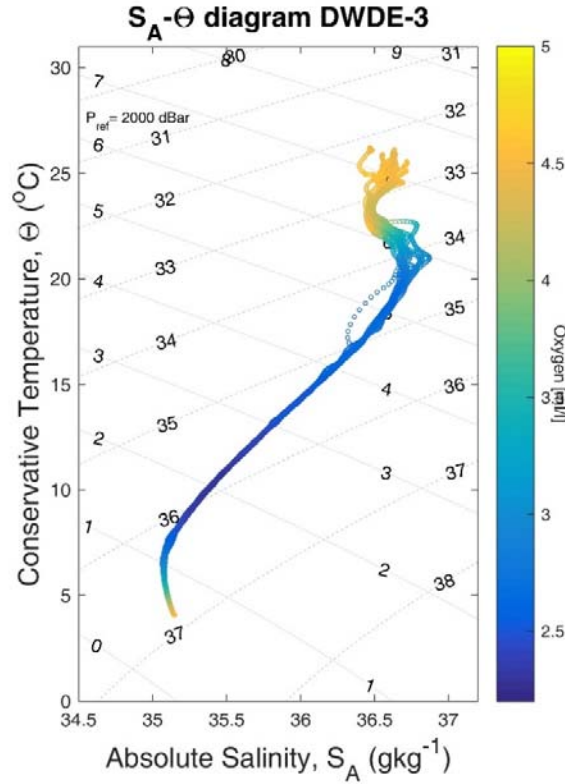


Figure 6: Absolute Salinity vs Conservative temperature diagram for downcast data DWDE-3 σ_t and π (spiciness) contours are shown every 1.0 g/kg.

5.1 Section South

Cross-shelf section plots of In Conservative Temperature, Absolute Salinity, Oxygen, Beam Transmissivity, CDOM and Chlorophyll are shown from Figure 7 to Figure 20. Appendix E shows the corresponding plots for Section North.

Figure 7 shows the Conservative temperature section. It can be observed the shoaling and deepening of the isotherm around 50m. That is consistent with the presence of upwelling and downwelling caused by cyclones and anticyclones, respectively, but also by the jet formed by the collision of the anticyclone with the shelf-break. At 150m near the shelf a clear signal of cold waters is present, signaling upwelling. An interesting feature is present between 50 m and 150 m, about 90 km

offshore the shoaling and deepening of two isotherms at the same cross-shore distance suggest the presence of a subsurface structure.

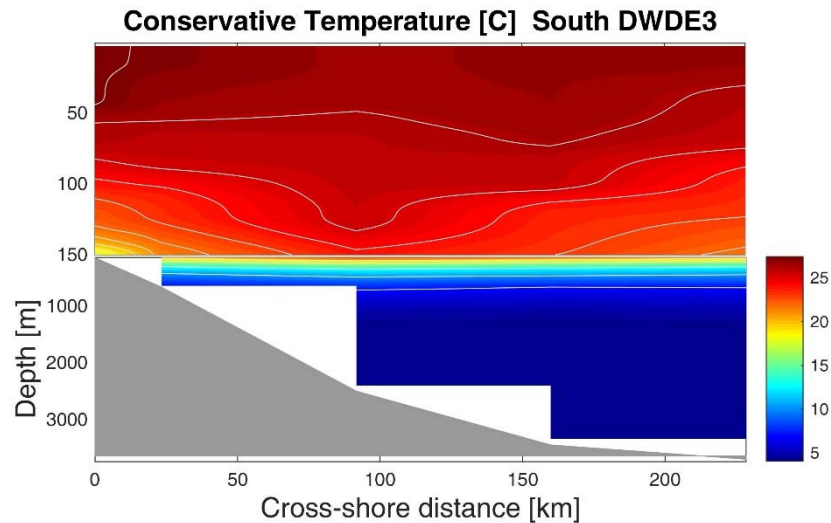


Figure 7: Conservative Temperature section South DWDE3.

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.

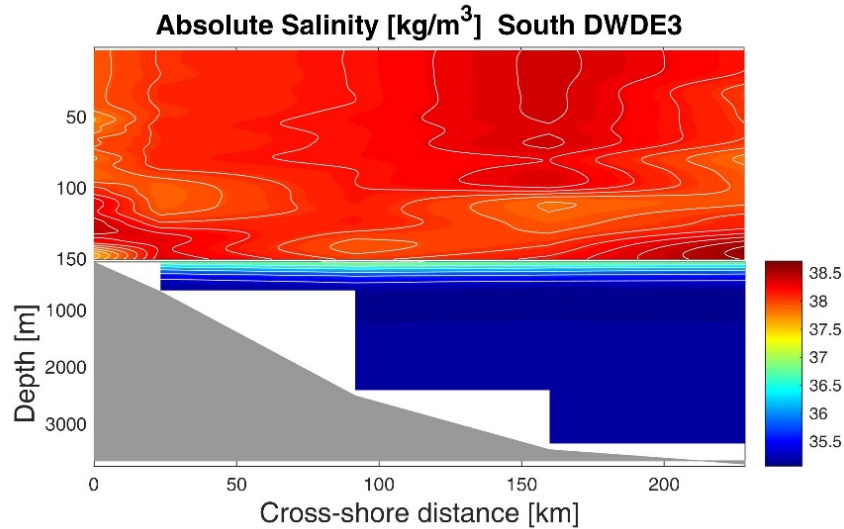


Figure 8: Absolute Salinity section South DWDE3 cruise.

Figure 8 shows a core of high salinity ($S \sim 38.5$) extending down to 100 m, probably related with the sampled anticyclone. Several blobs of less saline water ($S \sim 37.5$) are also detectable in the section. Large values of salinity ($S > 37$) in the upper 150 m suggest a well-mixed surface layer.

Figure 9 shows oxygen concentration. In general the plot shows a mixed surface layer, although some structure can also be observed: several subsurface maximums in oxygen ($O > 0.4$ ml/l) between 50 and 100 m, and minimums ($O < 0.3$ ml/l) between 100 and 150 meters close to the shelf and at the end of the section, and between 500 and 150 m in the rest of the section, and larger values ($O > 0.4$ ml/l) below 1000 m. The low values of oxygen below 100m, close to the shelf, are also consistent with upwelling, likely due to bottom friction between the along-shore jet that resulted from the anticyclone colliding with the shelf.

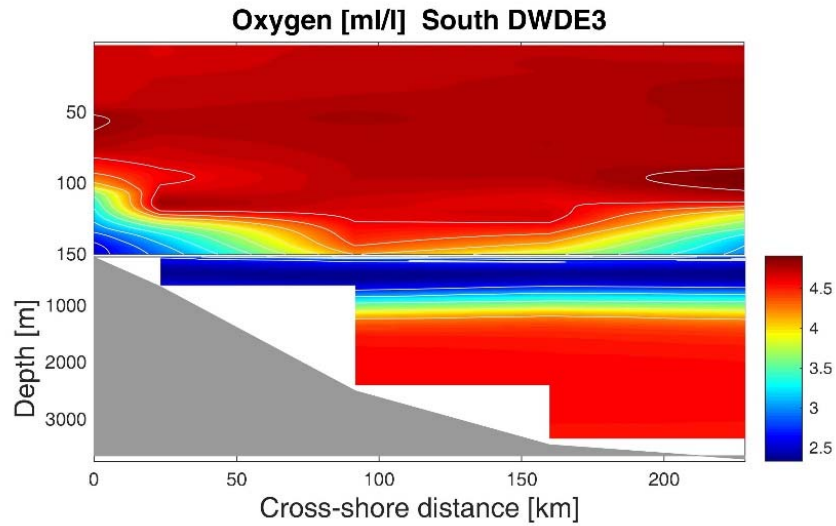


Figure 9: Oxygen section South DWDE3 cruise.

Figure 10 shows a shallow minimum of transmissivity around 100 km offshore, and a subsurface region with low transmissivity between 120 and 150m deep close to the shelf. It also shows a maximum in transmissivity between 100 and 150 m for almost all the section except close to the shelf. The surface minimum cannot be explained.

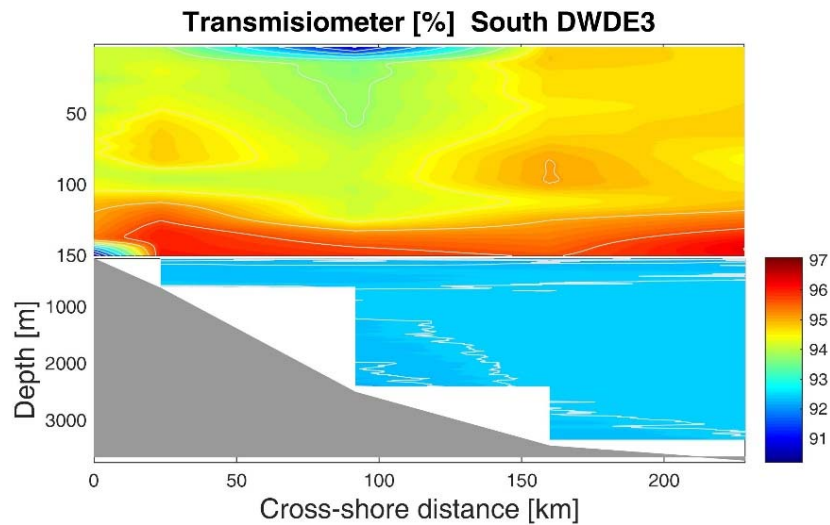


Figure 10: Beam transmission section South DWDE3.

Close to the shelf, several peaks of large Brunt-Vaisala frequency are located between 50m and 150m deep (Figure 11), the larger of the peaks ($N > 6s^{-2}$) is located just above the region of low transmissivity, this might be related with the position of the pycnocline. The other peaks ($N \sim 5s^{-2}$) are located between 50m and 100m.

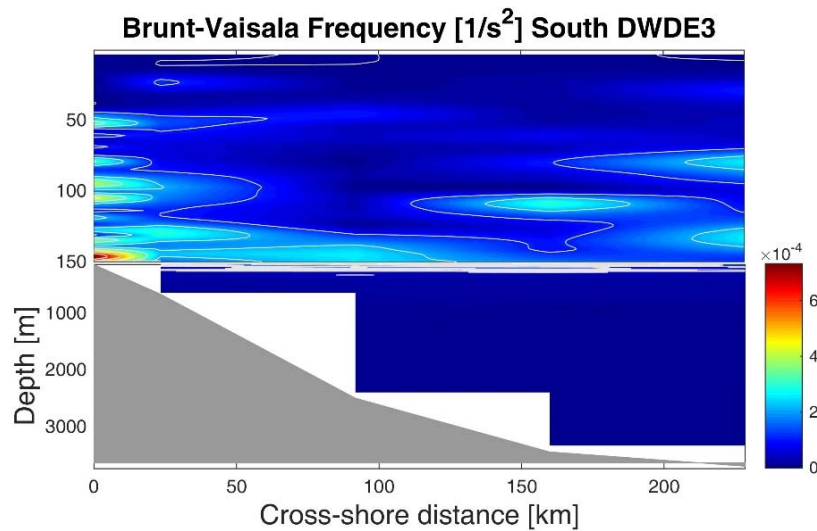


Figure 11: Brunt-Vaisala Frequency section South DWDE3.

The CDOM section in Figure 12 shows large values ($>0.8 \text{ mg/m}^3$) below 1000 m and between 100m and 150m close to the shelf and at the end of the section.

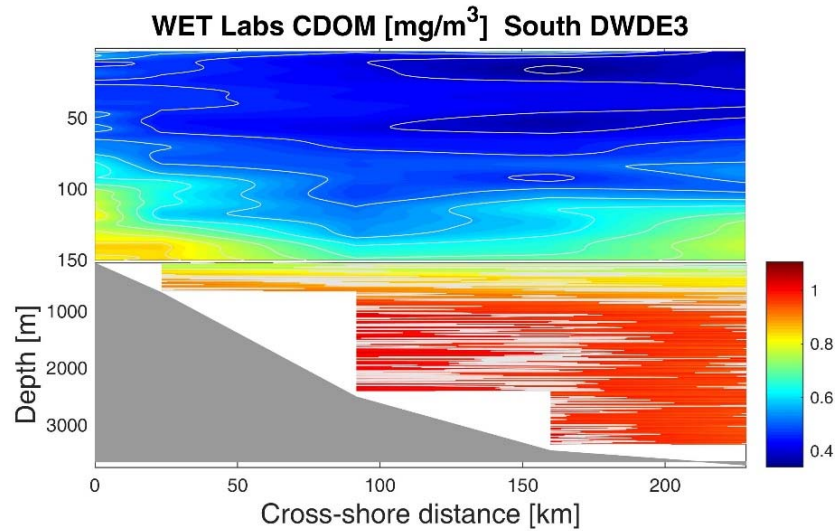


Figure 12: Colored Dissolved Organic Matter section
South DWDE3.

Figure 13: Chelsea Chlorophyll-a Aqua sensor DWDE3. Figure 13 shows Chlorophyll-a in the section. The sensor detects a region of high concentration between 90 and 130 m approximately for all the section. This is located above the high transmissivity region in Figure 10 but above the high CDOM region.

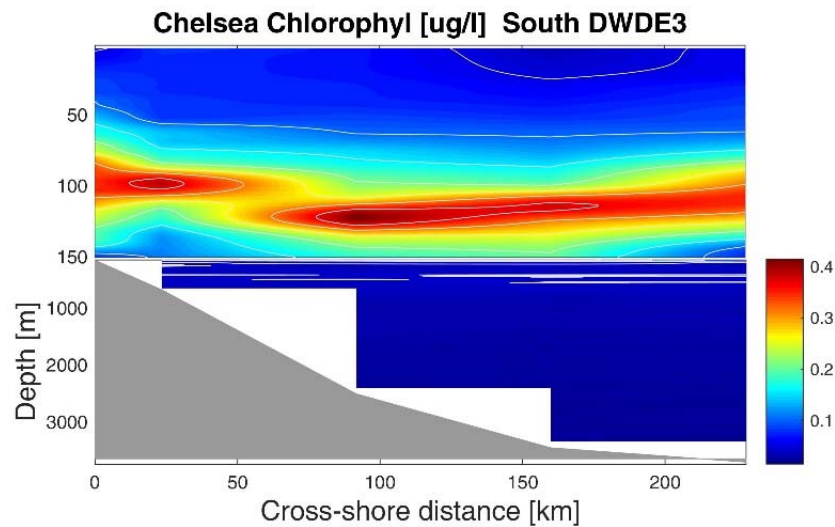


Figure 13: Chelsea Chlorophyll-a Aqua sensor DWDE3.

5.2 Section North

The same variables, as those in the previous section, are shown here for the North section from Figure 14 to Figure 20.

Figure 14 shows the Conservative temperature section. First thing to notice is the minimum bottom depth reached in this section is about 1300m due to the loss of the CTD Rossette. It can be observed the shoaling of the isotherm around 20m hinting the presence of a cyclonic circulation. As observed in the South section there is a hint of the same subsurface structure now between 0 and 40 km offshore the first cast. The plot also suggests a good mixing of the first 140 m of water.

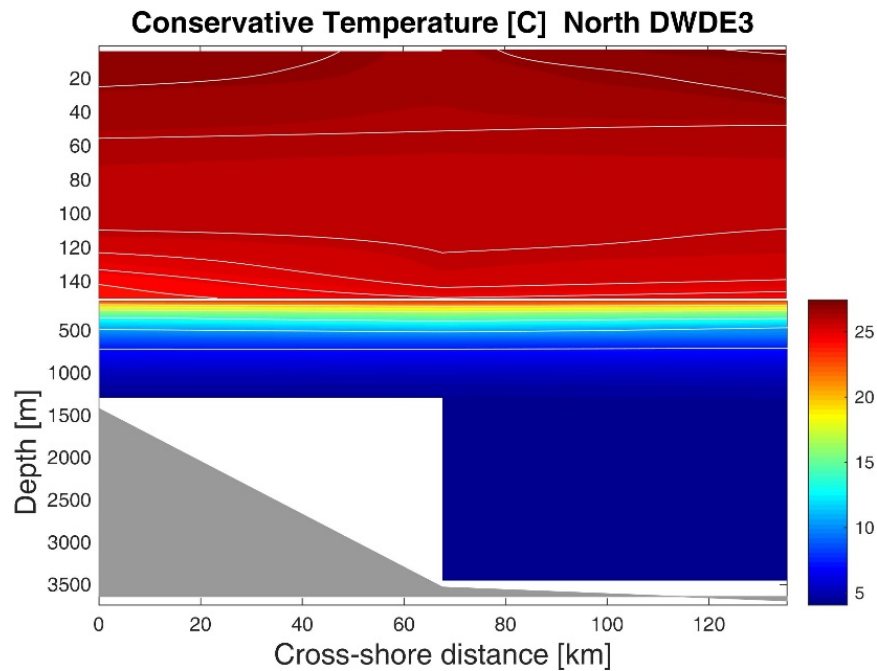


Figure 14: Conservative Temperature section North DWDE3.

A core of high salinity ($S \sim 38.5$) extending down to 100 m, probably related with the sampled anticyclone is shown in Figure 15. Several blobs of less saline water ($S \sim 37.5$) are also detectable in the section. Large values of salinity ($S > 37$) in the upper 150 m suggest a well-mixed surface layer.

Oxygen concentration (Figure 16) shows the surfacing of one of the isolines of oxygen concentration is a signal of the presence of cyclonic circulation, consistent also with the shoaling of isotherms in Figure 14. A large peak ($O > 4.5$ ml/l) at 60 m is observed across all the section. The characteristic minimum in oxygen is observed between 150 and 1000 m, and oxygen rich ($O > 4$ ml/l) deep waters are also observed.

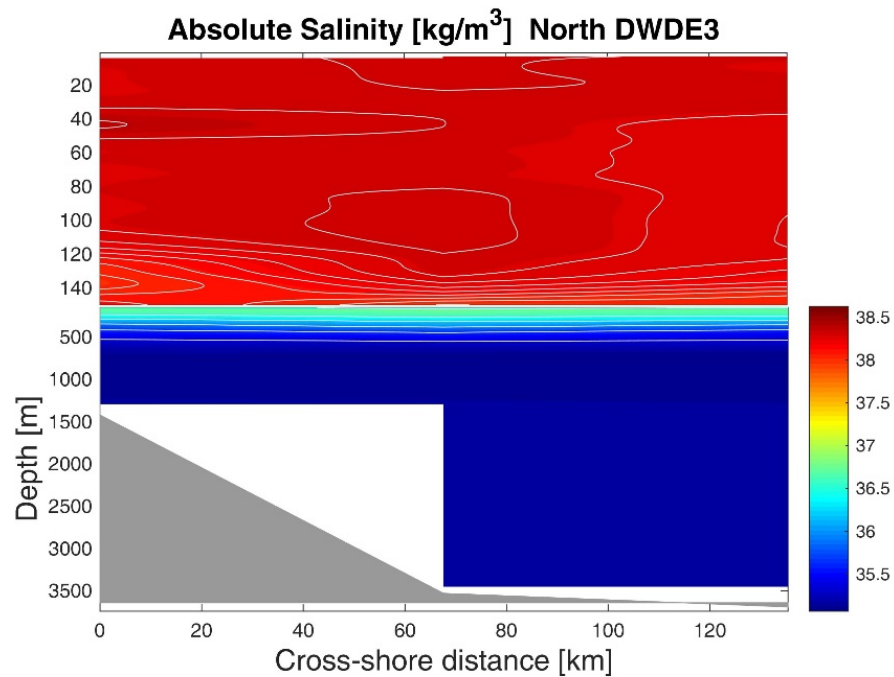


Figure 15: Absolute Salinity section North DWDE3 cruise.

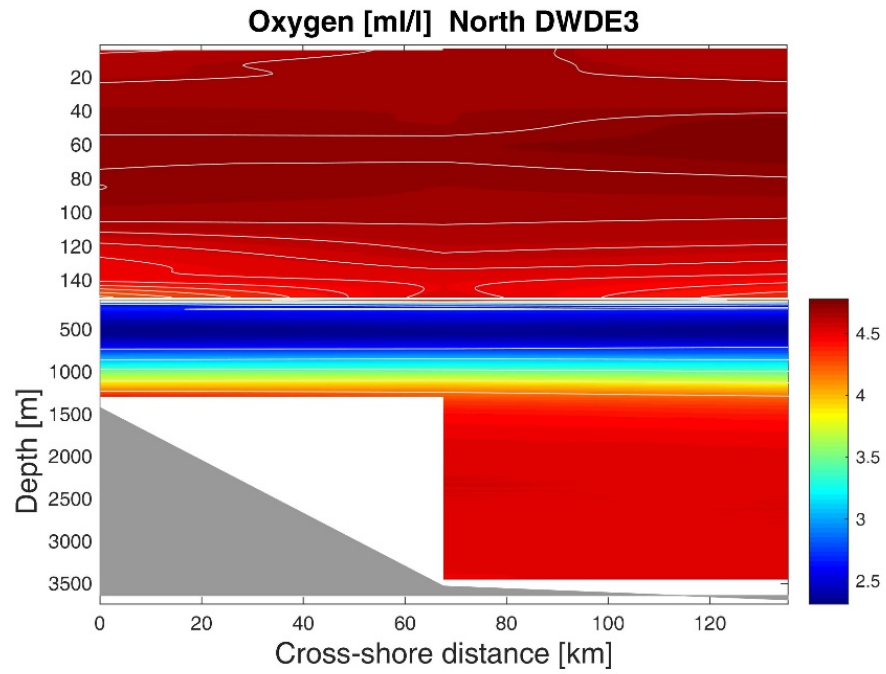


Figure 16: Oxygen section North DWDE3 cruise.

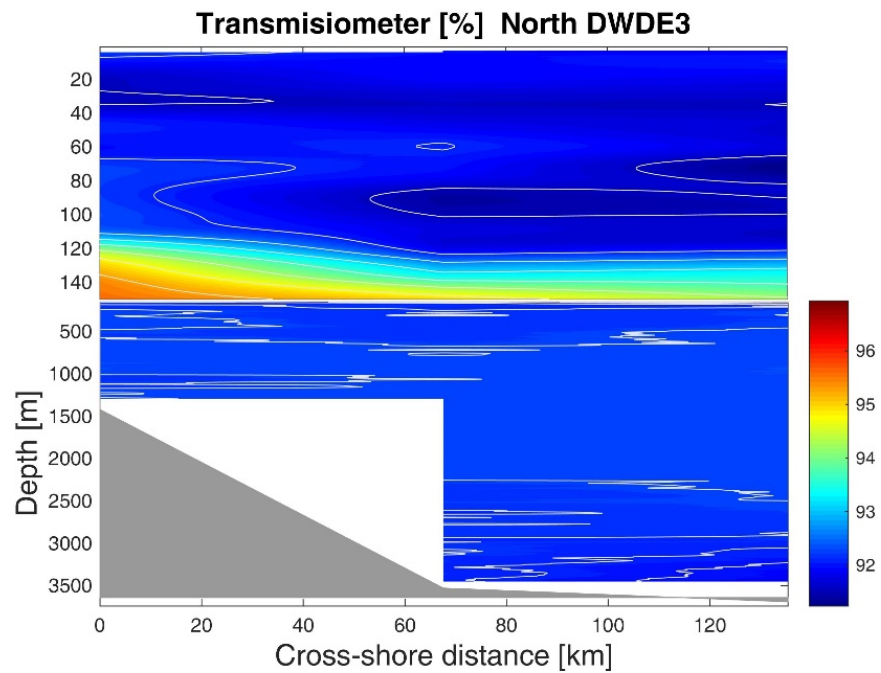


Figure 17: Beam transmission section North DWDE3.

Figure 17 shows different cores of low transmissivity in the first 100 m. A core of high transmissivity is observed between 120 and 150 m. That maximum lies below the high Chlorophyll-a in Figure 20 and on coincides with the high Brunt-Vaisala frequency region in Figure 18. Organic detritus falling down must find a barrier at this very stratified region, a large accumulation of particled organic matter in this region is thus expected but not observed in the transmissivity data.

Figure 18 shows the section is not well mixed. Several peaks of the Brunt-Vaisala frequency (BVF) are located in the first 60m. But a region of high BVF ($N > 2s^{-2}$) is located on top of the region of high transmissivity between 140 and 150 m deep. This suggests that the observed shallow structure was developed after well-mixed conditions were established. This could be compared with wind conditions and SST before the cruise, but it is beyond the scope of this report.

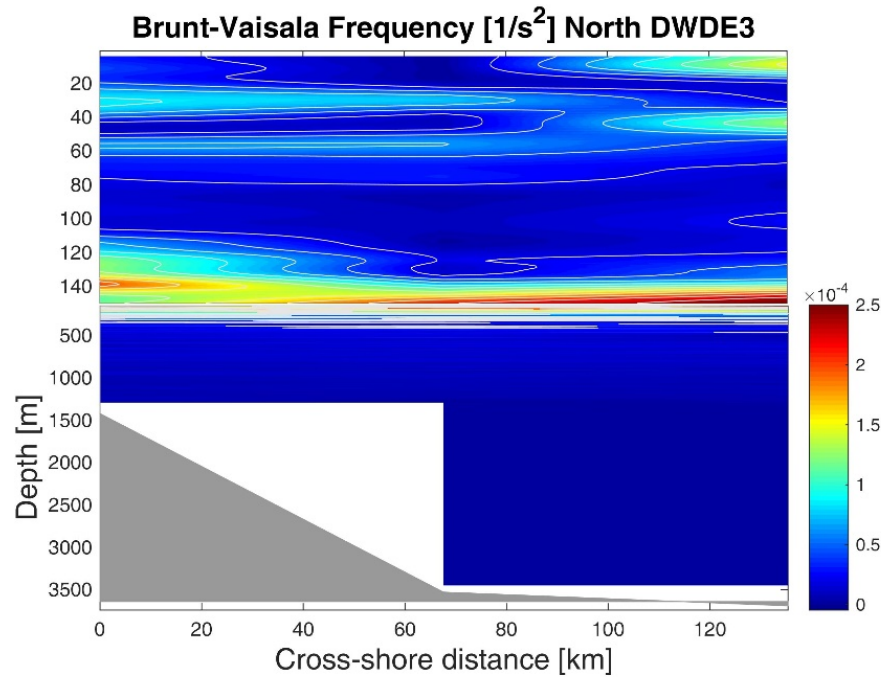


Figure 18: Brunt-Vaisala Frequency section North DWDE3.

The CDOM section in Figure 19 shows large values ($>0.8 \text{ mg/m}^3$) below 150 m. Some structure is visible in the isolines of concentration.

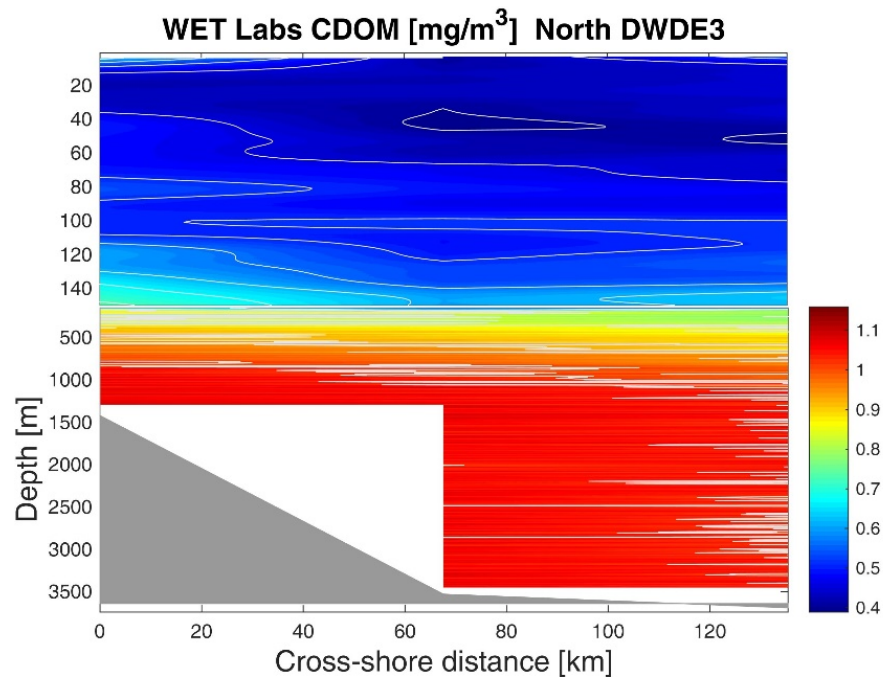


Figure 19: Colored Dissolved Organic Matter section
North DWDE3.

Figure 13: Chelsea Chlorophyll-a Aqua sensor DWDE3. Figure 20 shows Chlorophyll-a in the section. The sensor detects a region of high concentration between 100 and 140 m approximately for all the section. This is located above the high transmissivity region in Figure 10 Figure 17.

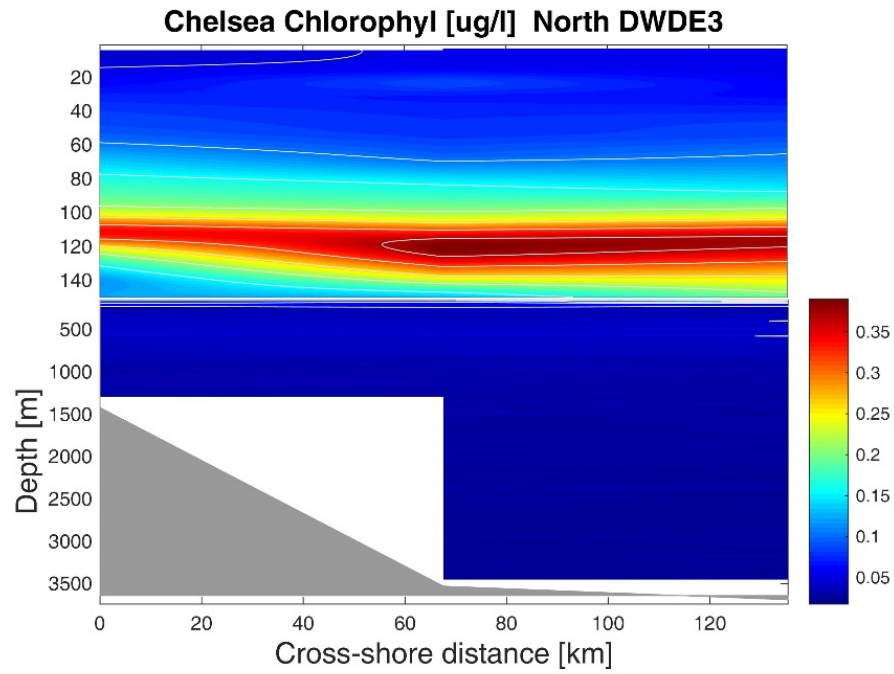


Figure 20: Chelsea Chlorophyl-a Aqua sensor DWDE3.

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

Agradecimientos

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7 Appendix

7.1 APPENDIX A. Scientific Crew

Scientific crew DWDE2

| Name | Institution |
|---------------------------|-------------|
| Dra. Paula Pérez Brunius* | CICESE |
| Sharon Herzka | CICESE |
| Rainer M. W. Amon | TAMUG |
| Sergei Molodstov | TAMUG |
| Paula García Carrillo | CICESE |
| Argelia Ronquillo | CICESE |
| Alejandro Domínguez | CICESE |
| Mónica Cecilia Mozqueda | CICESE |
| Javier Rodríguez | CICESE |
| Jesús Cano | CICESE |
| Oscar Hernández | CICESE |
| Andrés Sandoval | UABC |
| Cesar Liera | UABC |
| * Chief Scientist | |

7.2 APPENDIX B. CTD calibration sheets

PSA file: D:\CTD Data\2016\PE16_25_Bower_CTD\PE17_19_Perez2.psa

Instrument configuration file:

F:\ADominguez\DATA\DWDE3\DATA\PE17_19_Perez_CTD\RAW\Seabird\PE17_19_Perez2.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 : 4515
Calibrated on : 25-Jan-2017
G : 4.42214277e-003
H : 6.47522810e-004
I : 2.23428851e-005
J : 1.80568064e-006
F0 : 1000.000
Slope : 1.00000000
Offset : 0.0000

2) Frequency 1, Conductivity

Serial number : 0264w
Calibrated on : 15-Mar-17
G : -4.02240641e+000
H : 4.65717665e-001

I : -2.83822656e-003
J : 2.19486173e-004
CTcor : 3.2500e-006
CPcor : -9.57000000e-008
Slope : 1.00000000
Offset : 0.00000
Cell Const : 2000.0000
Series R : 300.0000

3) Frequency 2, Pressure, Digiquartz with TC

Serial number : 0797
Calibrated on : 19-Jan-17
C1 : -4.289259e+004
C2 : -2.342210e-002
C3 : 1.233970e-002
D1 : 3.704000e-002
D2 : 0.000000e+000
T1 : 3.043431e+001
T2 : -3.431844e-004
T3 : 4.427170e-006
T4 : 2.063150e-009
T5 : 0.000000e+000
Slope : 0.99998630
Offset : -0.11922
AD590M : 1.287000e-002
AD590B : -8.640080e+000

4) Frequency 3, Temperature, 2

Serial number : 0657

Calibrated on : 10-Nov-2016

G : 4.82531882e-003

H : 6.75177888e-004

I : 2.73168061e-005

J : 2.27946833e-006

F0 : 1000.000

Slope : 1.00000000

Offset : 0.0000

5) Frequency 4, Conductivity, 2

Serial number : 0842w

Calibrated on : 15-Mar-17

G : -3.98368391e+000

H : 4.32841046e-001

I : 2.42720746e-003

J : -1.38891642e-004

CTcor : 3.2500e-006

CPcor : -9.57000000e-008

Slope : 1.00000000

Offset : 0.00000

Cell Const : 2000.0000

Series R : 300.0000

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

Serial number : 1224

Calibrated on : 2016-12-10

Equation : Sea-Bird

Soc : 4.54300e-001

Offset : -5.04700e-001

A : -3.77310e-003
B : 1.92210e-004
C : -2.48620e-006
E : 3.60000e-002
Tau20 : 1.06000e+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 : 0769
Calibrated on : 10-Nov-2016
Equation : Sea-Bird
Soc : 4.84400e-001
Offset : -5.10400e-001
A : -3.27240e-003
B : 1.38310e-004
C : -2.00910e-006
E : 3.60000e-002
Tau20 : 1.30000e+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, Transmissometer, WET Labs C-Star

Serial number : 489DR
Calibrated on : 11-23-16
M : 19.8100
B : 0.1189
Path length : 0.250

9) A/D voltage 3, Altimeter

Serial number : 45111
Calibrated on :
Scale factor : 15.000
Offset : 0.000

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

Serial number : FLCDRTD-742
Calibrated on : 5/22/2007
Dark output : 0.066
Scale factor : 50.000

11) A/D voltage 5, Fluorometer, Chelsea Aqua 3

Serial number : 088-009
Calibrated on : 12-21-16
VB : 0.148100
V1 : 1.809600
Vacetone : 0.246100
Scale factor : 1.000000
Slope : 1.000000
Offset : 0.000000

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, Fluorometer, Chelsea UV Aquatracka, 2

Serial number : 15-7733-001

Calibrated on : 02/23/2016

A : 0.000972

B : -0.056291

14) SPAR voltage, Unavailable

15) SPAR voltage, SPAR/Surface Irradiance

Serial number : 6409

Calibrated on : 11/07/16

Conversion factor : 1625.46729000

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\2017\PE17_19_Perez_CTD\LAN_004.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
prompt 0 = Event Number (yyyymmddhhhh)
prompt 1 = Local Time (hhhh)
prompt 2 = Activity
prompt 3 = Latitude (dd mm.mmm N)
prompt 4 = Longitude (dd mm.mmm W)
prompt 5 = Bottom Depth (m)
prompt 6 = Station #

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
figuration report for SBE

911plus/917plus CTD

APPENDIX C: ADCP processing logbooks

7.2.1 ADCP WH1200 kHz

7.2.2 2017-05-01 19:23:50,210 INFO quick_adcp importing numpy version 1.8.2

7.2.3 2017-05-01 19:23:50,225 INFO quick_adcp importing matplotlib version 1.4.3

7.2.4 2017-05-01 19:23:50,369 INFO quick_adcp
=====

7.2.5 2017-05-01 19:23:50,369 INFO quick_adcp
=====

7.2.6 2017-05-01 19:23:50,369 INFO quick_adcp command line was:
/usr/local/currents/bin/run_quick.py -d wh1200

7.2.7 2017-05-01 19:23:50,369 INFO quick_adcp cwd is
/home/data/PE17_19_Perez_ADCP/proc/wh1200

7.2.8 about to run these steps:

7.2.9 - write_clearflags

7.2.10 - scandata

7.2.11 - avg_and_load

7.2.12 - codaseditsetup

7.2.13 - setflags

7.2.14 - getnav

7.2.15 - lst_hdg

7.2.16 - plot_headcorr

7.2.17 - navsteps

7.2.18 - find_pflags

7.2.19 - apply_edit

7.2.20 - navsteps

7.2.21 - lst_temp

7.2.22 - plot_temp

7.2.23 - lst_npings

7.2.24 - calib

7.2.25 - matfiles

7.2.26 - adcpsect

7.2.27 - refabs

7.2.28 - smoothnav

7.2.29 - putnav

7.2.30 - refplots

7.2.31 - find_pflags

7.2.32 - codaseditsetup

7.2.33 2017-05-01 19:23:50,389 INFO quick_adcp -----

7.2.34 2017-05-01 19:23:50,389 INFO quick_adcp step 1: set up files in "edit"
directory

7.2.35

7.2.36 2017-05-01 19:23:50,389 INFO quick_adcp -----

7.2.37 2017-05-01 19:23:50,389 INFO quick_adcp step 2: scan files for time
range

7.2.38

7.2.39 2017-05-01 19:23:50,466 INFO quick_adcp looking for database with
adcpdb/a_pe*.blk

7.2.40 2017-05-01 19:23:50,466 INFO quick_adcp database found: listing blocks

7.2.41 2017-05-01 19:23:50,480 INFO quick_adcp -----

7.2.42 2017-05-01 19:23:50,481 INFO quick_adcp step 3: generate averaged
data...

7.2.43 2017-05-01 19:23:50,509 INFO quick_adcp -----

7.2.44 2017-05-01 19:23:50,509 INFO quick_adcp step 4: load averaged data
(to database)

7.2.45 2017-05-01 19:23:50,566 INFO quick_adcp database time range:

7.2.46 2017-05-01 19:23:50,567 INFO quick_adcp 2017/04/22 23:25:53 to
2017/05/01 19:23:54

7.2.47 2017-05-01 19:23:50,567 INFO quick_adcp (111.976308 to 120.808264)

7.2.48 2017-05-01 19:23:50,596 INFO quick_adcp -----

7.2.49 2017-05-01 19:23:50,596 INFO quick_adcp step 5: set up files for codas
editing (gautoedit.py)

7.2.50

7.2.51 2017-05-01 19:23:50,597 INFO quick_adcp -----

7.2.52 2017-05-01 19:23:50,597 INFO quick_adcp step 6: run setflags?

7.2.53

7.2.54 2017-05-01 19:23:50,655 INFO quick_adcp -----

7.2.55 2017-05-01 19:23:50,655 INFO quick_adcp step 7: get navigation

7.2.56

7.2.57 2017-05-01 19:23:51,057 INFO quick_adcp -----

7.2.58 2017-05-01 19:23:51,057 INFO quick_adcp step 8: list heading

7.2.59

7.2.60 2017-05-01 19:23:51,095 INFO quick_adcp -----

7.2.61 2017-05-01 19:23:51,096 INFO quick_adcp step 9: plot heading correction

7.2.62

7.2.63 2017-05-01 19:23:51,708 INFO quick_adcp

7.2.64 -----

7.2.65 2017-05-01 19:23:51,708 INFO quick_adcp ---- running navsteps ---

7.2.66 2017-05-01 19:23:51,708 INFO quick_adcp -----

7.2.67 2017-05-01 19:23:51,708 INFO quick_adcp step 10: nav steps: run
adcpsect

7.2.68 2017-05-01 19:23:51,708 INFO quick_adcp navstep 1

7.2.69 2017-05-01 19:23:51,791 INFO quick_adcp -----

7.2.70 2017-05-01 19:23:51,791 INFO quick_adcp step 11: nav steps: run refabs

7.2.71 2017-05-01 19:23:51,791 INFO quick_adcp navstep 2

7.2.72 2017-05-01 19:23:51,832 INFO quick_adcp -----

7.2.73 2017-05-01 19:23:51,833 INFO quick_adcp step 12: nav steps: run
smoothr for plots

7.2.74 2017-05-01 19:23:51,833 INFO quick_adcp navstep 3

7.2.75 2017-05-01 19:23:52,067 INFO quick_adcp -----

7.2.76 2017-05-01 19:23:52,067 INFO quick_adcp step 13: nav steps: smooth
navigation for velocities

7.2.77 2017-05-01 19:23:52,067 INFO quick_adcp navstep 4

7.2.78 2017-05-01 19:23:52,310 INFO quick_adcp -----

7.2.79 2017-05-01 19:23:52,310 INFO quick_adcp step 14: nav steps: put
positions and uvship from refsm into codasdb

7.2.80 2017-05-01 19:23:52,310 INFO quick_adcp navstep 5

7.2.81 2017-05-01 19:23:52,708 INFO quick_adcp -----

7.2.82 2017-05-01 19:23:52,708 INFO quick_adcp step 15: nav steps: make
reflayer plots

7.2.83 2017-05-01 19:23:52,708 INFO quick_adcp navstep 6

7.2.84 2017-05-01 19:23:53,368 INFO quick_adcp -----

7.2.85 2017-05-01 19:23:53,368 INFO quick_adcp step 10: find profile flags

7.2.86

7.2.87 2017-05-01 19:23:53,560 INFO quick_adcp -----

7.2.88 2017-05-01 19:23:53,561 INFO quick_adcp step 11: apply editing

7.2.89

7.2.90 2017-05-01 19:23:53,644 INFO quick_adcp -----

7.2.91 2017-05-01 19:23:53,645 INFO quick_adcp step 12: run calibration steps

7.2.92

7.2.93 2017-05-01 19:23:54,590 INFO quick_adcp -----

7.2.94 2017-05-01 19:23:54,590 INFO quick_adcp step 13: extract and plot
temperature

7.2.95

7.2.96 2017-05-01 19:23:54,878 INFO quick_adcp -----

7.2.97 2017-05-01 19:23:54,879 INFO quick_adcp step 14: extract and plot
number of pings per ensemble

7.2.98

7.2.99 2017-05-01 19:23:55,117 INFO quick_adcp -----

7.2.100 2017-05-01 19:23:55,117 INFO quick_adcp step 15: extract matlab
"allbins"

7.2.101

7.2.102 2017-05-01 19:23:55,552 INFO quick_adcp -----

7.2.103 2017-05-01 19:23:55,552 INFO quick_adcp writing "cruise_info.txt"

7.2.104 ADCP WH300 kHz

```

2017-05-01 19:24:03,480 INFO    quick_adcp    importing numpy version 1.8.2
2017-05-01 19:24:03,491 INFO    quick_adcp    importing matplotlib version 1.4.3
2017-05-01      19:24:03,631      INFO                                quick_adcp
=====
2017-05-01      19:24:03,631      INFO                                quick_adcp
=====
2017-05-01 19:24:03,631 INFO                quick_adcp    command line was:
/usr/local/currents/bin/run_quick.py -d wh300
2017-05-01 19:24:03,631 INFO                                quick_adcp    cwd is
/home/data/PE17_19_Perez_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_nplings
- calib
- matfiles
- adcpsect
- refabs
- smoothnav
- putnav
- refplots
- find_pflags
- codaseditsetup

```

2017-05-01 19:24:03,652 INFO    quick_adcp  -----
2017-05-01 19:24:03,652 INFO    quick_adcp  step 1: set up files in "edit" directory

2017-05-01 19:24:03,652 INFO    quick_adcp  -----
2017-05-01 19:24:03,652 INFO    quick_adcp  step 2: scan files for time range

2017-05-01 19:24:03,729 INFO    quick_adcp  looking for database with
adcpdb/a_pe*.blk

2017-05-01 19:24:03,729 INFO    quick_adcp  database found: listing blocks

2017-05-01 19:24:03,740 INFO    quick_adcp  -----
2017-05-01 19:24:03,740 INFO    quick_adcp  step 3: generate averaged data...

2017-05-01 19:24:03,768 INFO    quick_adcp  -----

```

| | | |
|------------------------------|------------|---|
| 2017-05-01 19:24:03,768 INFO | quick_adcp | step 4: load averaged data (to database) |
| 2017-05-01 19:24:03,802 INFO | quick_adcp | database time range: |
| 2017-05-01 19:24:03,802 INFO | quick_adcp | 2017/04/22 23:25:54 to 2017/05/01 19:23:54 |
| 2017-05-01 19:24:03,803 INFO | quick_adcp | (111.976319 to 120.808264) |
| 2017-05-01 19:24:03,828 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:03,828 INFO | quick_adcp | step 5: set up files for codas editing (gautoedit.py) |
| 2017-05-01 19:24:03,828 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:03,828 INFO | quick_adcp | step 6: run setflags? |
| 2017-05-01 19:24:03,886 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:03,886 INFO | quick_adcp | step 7: get navigation |
| 2017-05-01 19:24:04,291 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:04,291 INFO | quick_adcp | step 8: list heading |
| 2017-05-01 19:24:04,329 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:04,329 INFO | quick_adcp | step 9: plot heading correction |
| 2017-05-01 19:24:04,947 INFO | quick_adcp | ----- |

```

2017-05-01 19:24:04,947 INFO quick_adcp ---- running navsteps ---
2017-05-01 19:24:04,947 INFO quick_adcp -----
2017-05-01 19:24:04,947 INFO quick_adcp step 10: nav steps: run adcpsect
2017-05-01 19:24:04,947 INFO quick_adcp navstep 1
2017-05-01 19:24:05,022 INFO quick_adcp -----
2017-05-01 19:24:05,023 INFO quick_adcp step 11: nav steps: run refabs
2017-05-01 19:24:05,023 INFO quick_adcp navstep 2
2017-05-01 19:24:05,070 INFO quick_adcp -----
2017-05-01 19:24:05,070 INFO quick_adcp step 12: nav steps: run smoothr for
plots
2017-05-01 19:24:05,071 INFO quick_adcp navstep 3
2017-05-01 19:24:05,294 INFO quick_adcp -----
2017-05-01 19:24:05,295 INFO quick_adcp step 13: nav steps: smooth
navigation for velocities
2017-05-01 19:24:05,295 INFO quick_adcp navstep 4
2017-05-01 19:24:05,569 INFO quick_adcp -----
2017-05-01 19:24:05,569 INFO quick_adcp step 14: nav steps: put positions and
uvship from refsm into codasdb
2017-05-01 19:24:05,569 INFO quick_adcp navstep 5
2017-05-01 19:24:05,962 INFO quick_adcp -----
2017-05-01 19:24:05,962 INFO quick_adcp step 15: nav steps: make replayer
plots
2017-05-01 19:24:05,962 INFO quick_adcp navstep 6
2017-05-01 19:24:06,622 INFO quick_adcp -----

```

| | | |
|------------------------------|------------|---|
| 2017-05-01 19:24:06,622 INFO | quick_adcp | step 10: find profile flags |
| 2017-05-01 19:24:06,864 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:06,865 INFO | quick_adcp | step 11: apply editing |
| 2017-05-01 19:24:06,954 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:06,954 INFO | quick_adcp | step 12: run calibration steps |
| 2017-05-01 19:24:07,920 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:07,920 INFO | quick_adcp | step 13: extract and plot temperature |
| 2017-05-01 19:24:08,213 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:08,213 INFO | quick_adcp | step 14: extract and plot number of pings per ensemble |
| 2017-05-01 19:24:08,471 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:08,472 INFO | quick_adcp | step 15: extract matlab "allbins" |
| 2017-05-01 19:24:08,993 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:08,994 INFO | quick_adcp | writing "cruise_info.txt" |

7.2.105 ADCP OS75kHz

```

2017-05-01 19:24:17,350 INFO    quick_adcp    importing numpy version 1.8.2
2017-05-01 19:24:17,361 INFO    quick_adcp    importing matplotlib version 1.4.3
2017-05-01      19:24:17,503      INFO                                quick_adcp
=====
2017-05-01      19:24:17,503      INFO                                quick_adcp
=====
2017-05-01 19:24:17,503 INFO                quick_adcp    command line was:
/usr/local/currents/bin/run_quick.py -d os75nb
2017-05-01 19:24:17,503 INFO                quick_adcp    cwd    is
/home/data/PE17_19_Perez_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_nplings
- calib
- matfiles
- adcpsect
- refabs
- smoothnav
- putnav
- refplots
- find_pflags
- codaseditsetup

```

2017-05-01 19:24:17,513 INFO    quick_adcp  -----
2017-05-01 19:24:17,513 INFO    quick_adcp  step 1: set up files in "edit" directory

2017-05-01 19:24:17,513 INFO    quick_adcp  -----
2017-05-01 19:24:17,513 INFO    quick_adcp  step 2: scan files for time range

2017-05-01 19:24:17,608 INFO    quick_adcp  looking for database with
adcpdb/a_pe*.blk

2017-05-01 19:24:17,608 INFO    quick_adcp  database found: listing blocks

2017-05-01 19:24:17,624 INFO    quick_adcp  -----
2017-05-01 19:24:17,624 INFO    quick_adcp  step 3: generate averaged data...

2017-05-01 19:24:17,652 INFO    quick_adcp  -----

```


2017-05-01 19:24:17,652 INFO quick_adcp step 4: load averaged data (to database)

2017-05-01 19:24:17,713 INFO quick_adcp database time range:

2017-05-01 19:24:17,714 INFO quick_adcp 2017/04/22 23:28:55 to 2017/05/01 19:23:54

2017-05-01 19:24:17,714 INFO quick_adcp (111.978414 to 120.808264)

2017-05-01 19:24:17,738 INFO quick_adcp -----

2017-05-01 19:24:17,738 INFO quick_adcp step 5: set up files for codas editing (gautoedit.py)

2017-05-01 19:24:17,739 INFO quick_adcp -----

2017-05-01 19:24:17,739 INFO quick_adcp step 6: run setflags?

2017-05-01 19:24:17,774 INFO quick_adcp -----

2017-05-01 19:24:17,774 INFO quick_adcp step 7: get navigation

2017-05-01 19:24:18,103 INFO quick_adcp -----

2017-05-01 19:24:18,103 INFO quick_adcp step 8: list heading

2017-05-01 19:24:18,128 INFO quick_adcp -----

2017-05-01 19:24:18,128 INFO quick_adcp step 9: plot heading correction

2017-05-01 19:24:18,715 INFO quick_adcp

```

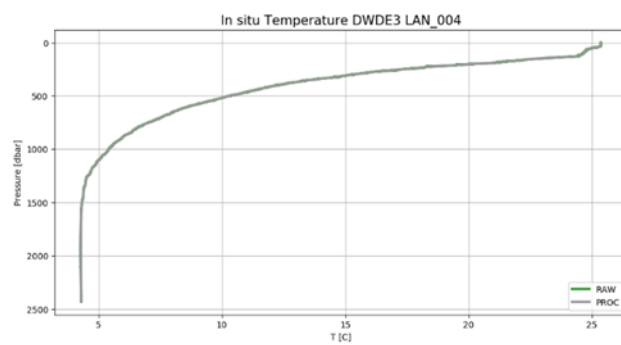
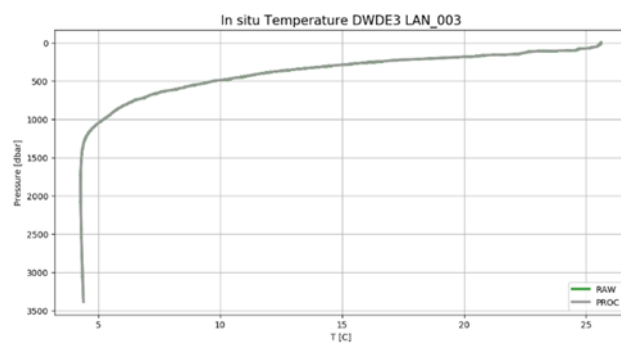
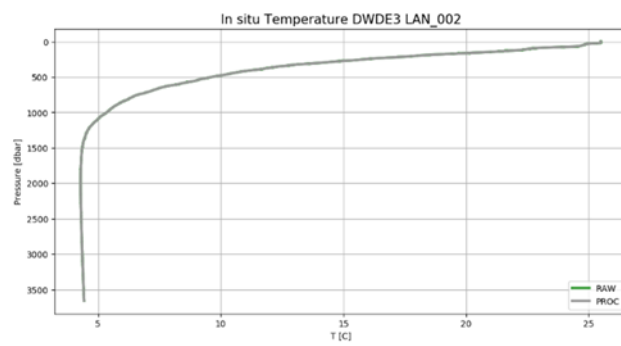
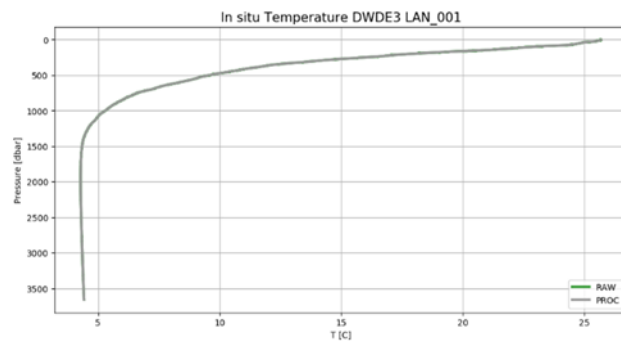
2017-05-01 19:24:18,716 INFO    quick_adcp  ---- running navsteps ---
2017-05-01 19:24:18,716 INFO    quick_adcp  -----
2017-05-01 19:24:18,716 INFO    quick_adcp  step 10: nav steps: run adcpsect
2017-05-01 19:24:18,716 INFO    quick_adcp  navstep 1
2017-05-01 19:24:18,754 INFO    quick_adcp  -----
2017-05-01 19:24:18,754 INFO    quick_adcp  step 11: nav steps: run refabs
2017-05-01 19:24:18,754 INFO    quick_adcp  navstep 2
2017-05-01 19:24:18,777 INFO    quick_adcp  -----
2017-05-01 19:24:18,777 INFO    quick_adcp  step 12: nav steps: run smoothr for
plots
2017-05-01 19:24:18,777 INFO    quick_adcp  navstep 3
2017-05-01 19:24:18,868 INFO    quick_adcp  -----
2017-05-01 19:24:18,868 INFO    quick_adcp  step 13: nav steps: smooth
navigation for velocities
2017-05-01 19:24:18,868 INFO    quick_adcp  navstep 4
2017-05-01 19:24:18,982 INFO    quick_adcp  -----
2017-05-01 19:24:18,982 INFO    quick_adcp  step 14: nav steps: put positions and
uvship from refsm into codasdb
2017-05-01 19:24:18,982 INFO    quick_adcp  navstep 5
2017-05-01 19:24:19,288 INFO    quick_adcp  -----
2017-05-01 19:24:19,288 INFO    quick_adcp  step 15: nav steps: make replayer
plots
2017-05-01 19:24:19,288 INFO    quick_adcp  navstep 6
2017-05-01 19:24:19,837 INFO    quick_adcp  -----

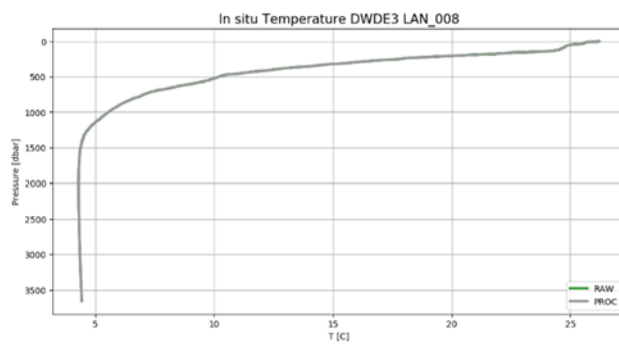
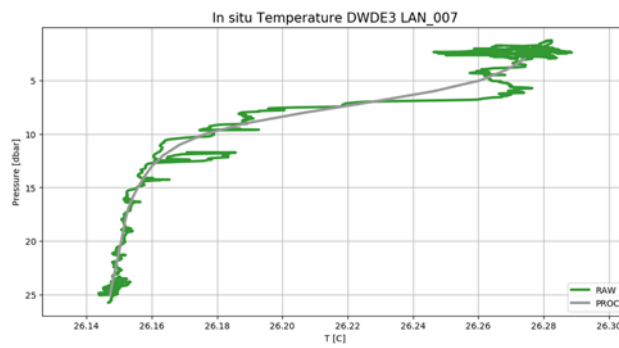
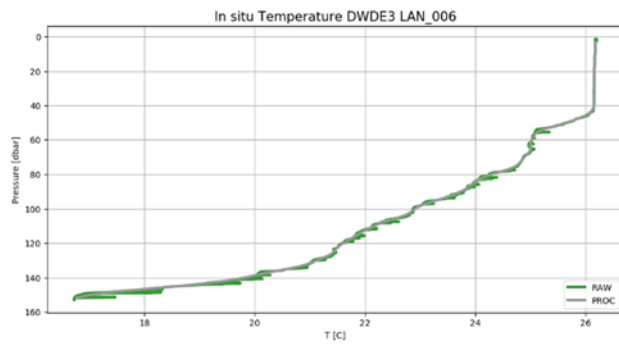
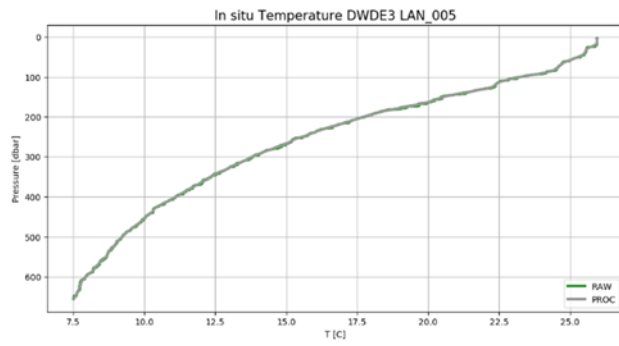
```

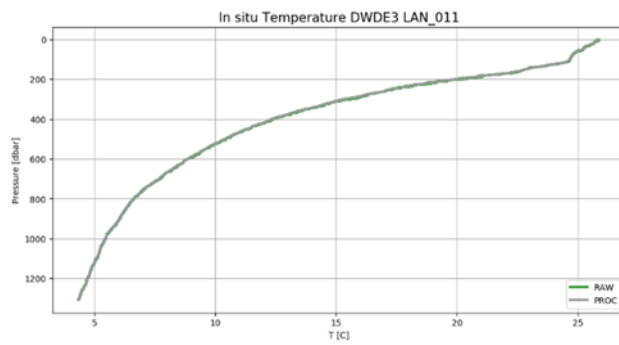
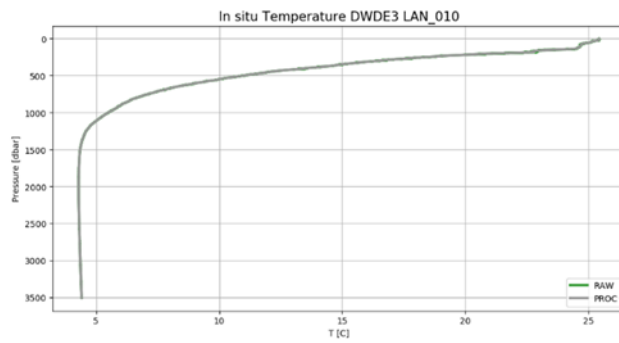
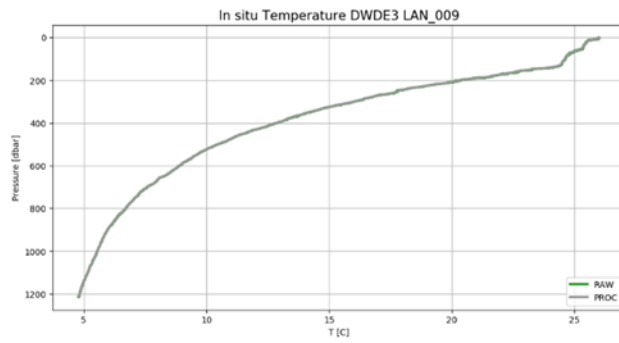
| | | |
|------------------------------|------------|---|
| 2017-05-01 19:24:19,837 INFO | quick_adcp | step 10: find profile flags |
| 2017-05-01 19:24:19,939 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:19,939 INFO | quick_adcp | step 11: apply editing |
| 2017-05-01 19:24:19,992 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:19,992 INFO | quick_adcp | step 12: run calibration steps |
| 2017-05-01 19:24:20,817 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:20,817 INFO | quick_adcp | step 13: extract and plot temperature |
| 2017-05-01 19:24:21,046 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:21,046 INFO | quick_adcp | step 14: extract and plot number of pings per ensemble |
| 2017-05-01 19:24:21,206 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:21,206 INFO | quick_adcp | step 15: extract matlab "allbins" |
| 2017-05-01 19:24:21,473 INFO | quick_adcp | ----- |
| 2017-05-01 19:24:21,473 INFO | quick_adcp | writing "cruise_info.txt" |

7.3 APPENDIX D CTD PROFILES

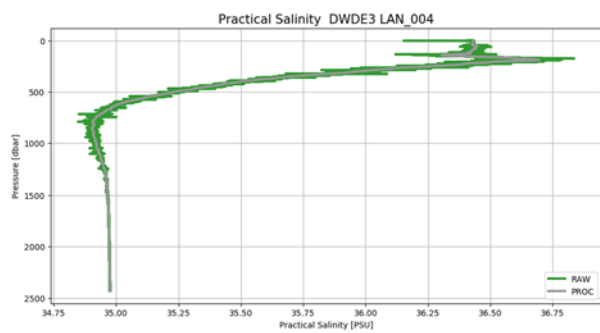
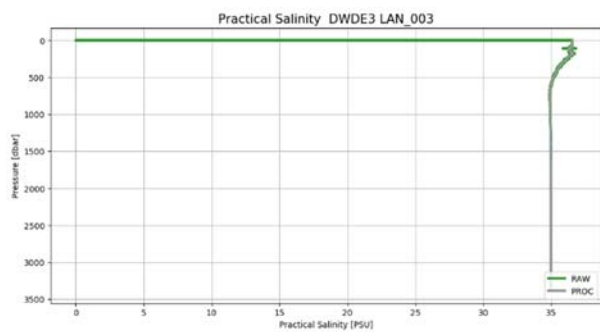
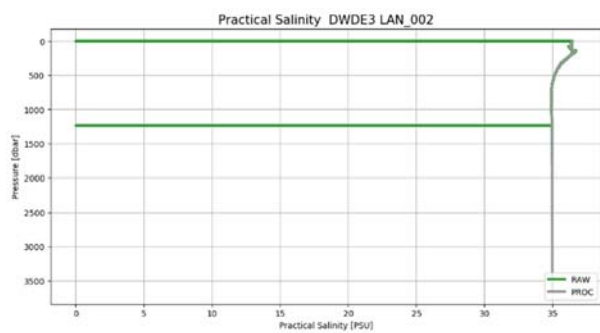
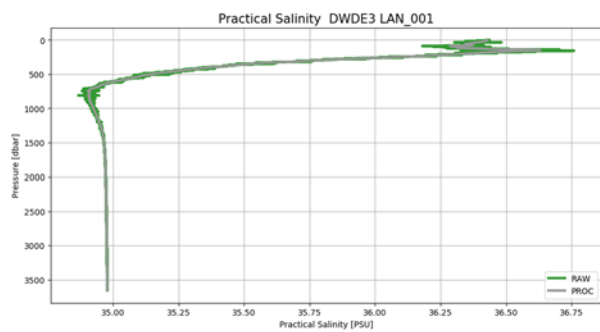
7.3.1 In situ Temperature

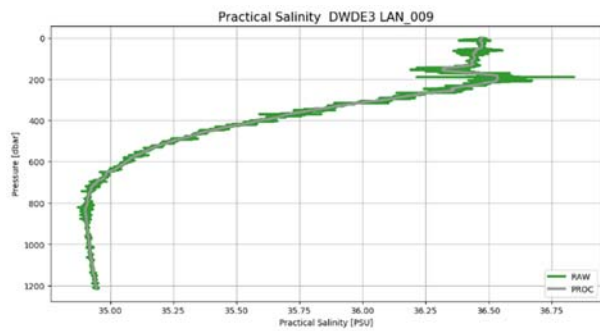
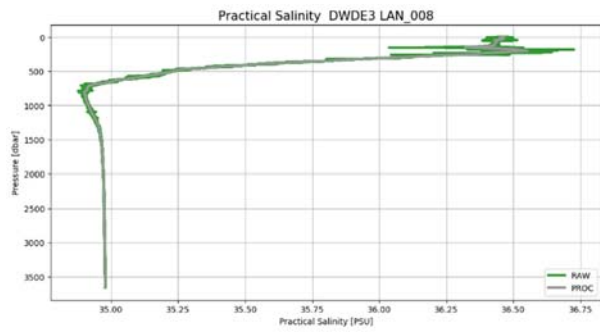
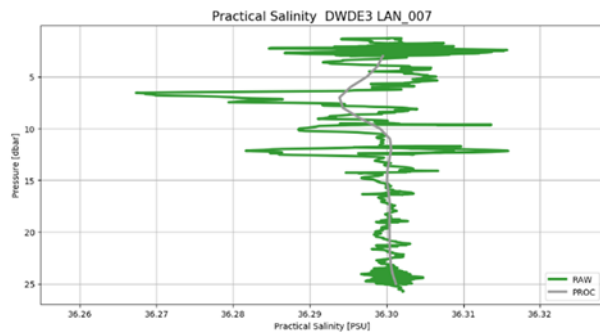
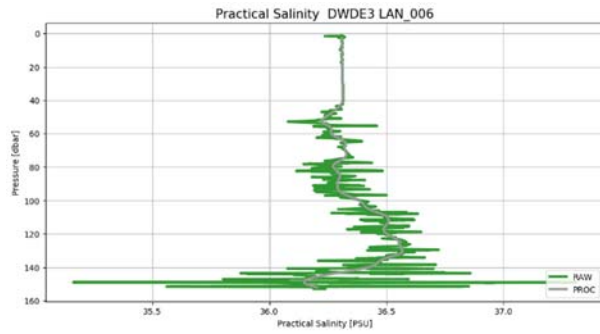
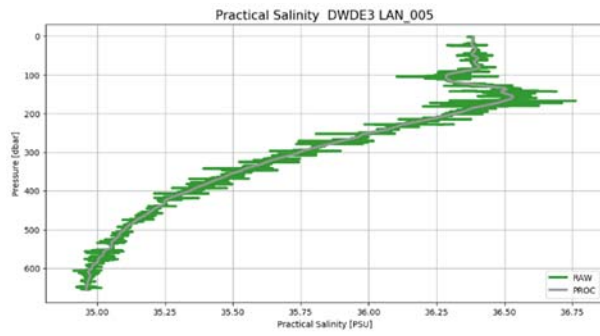


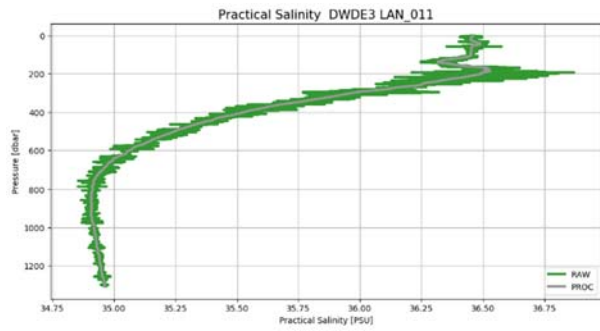
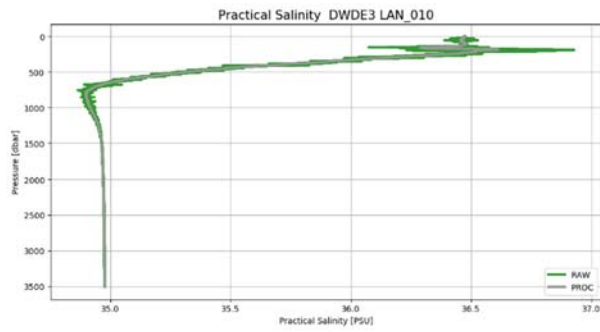




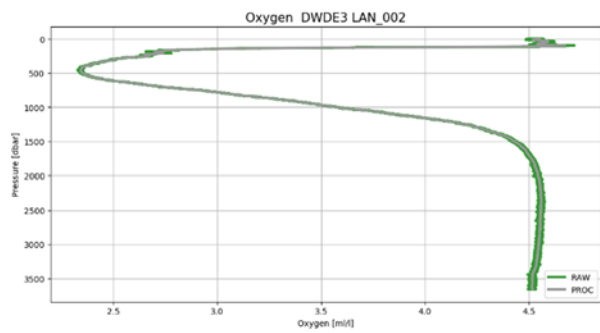
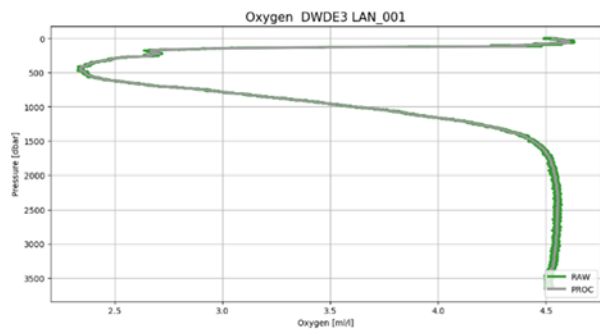
7.3.2 Practical Salinity

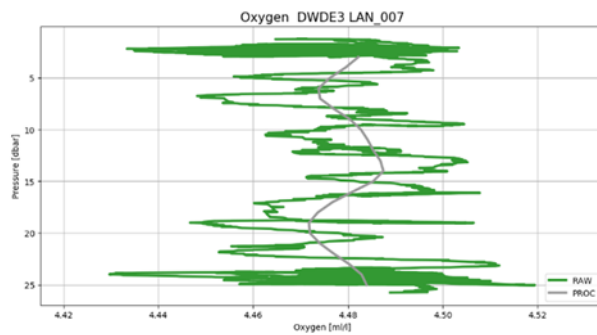
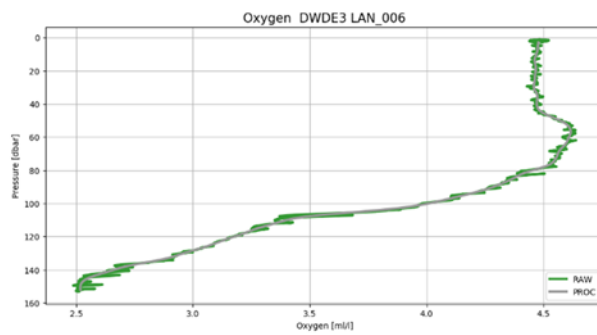
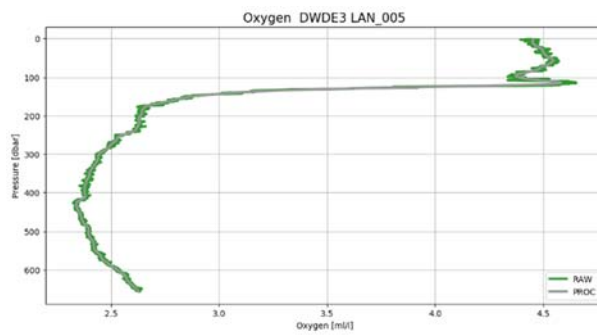
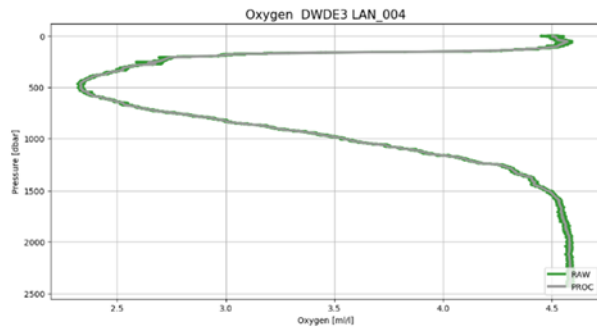
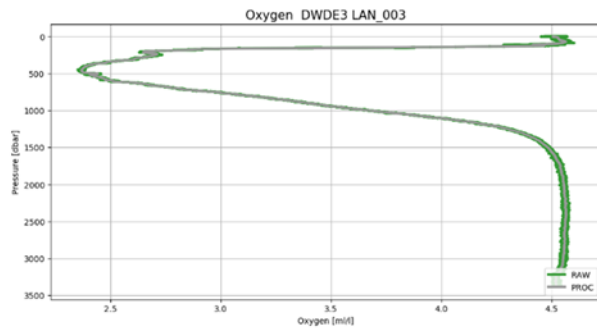


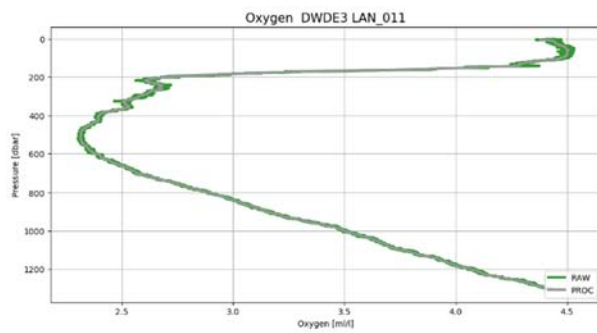
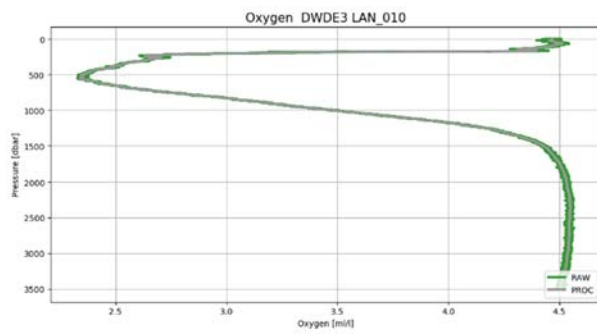
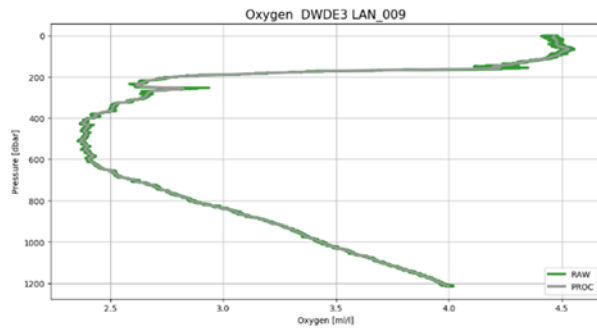
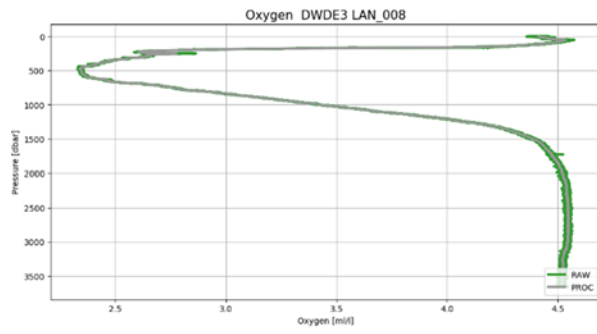




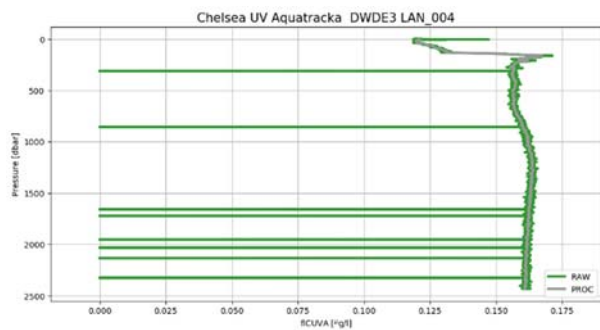
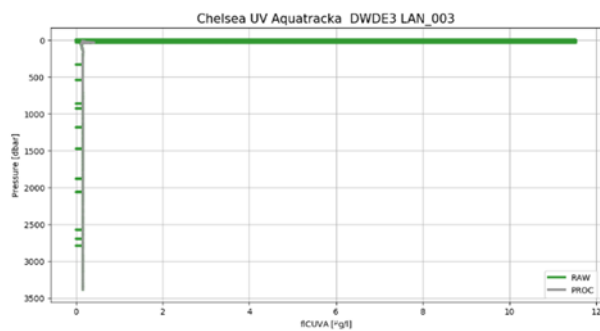
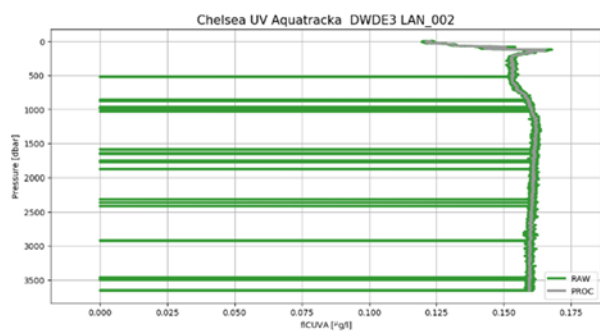
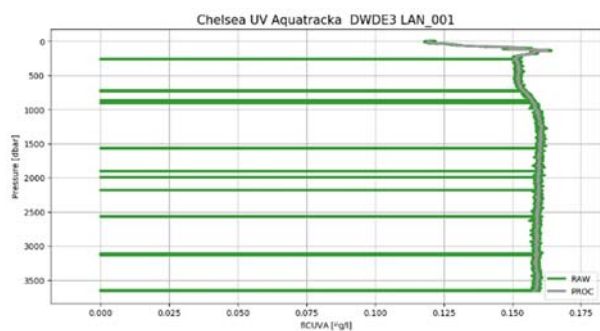
7.3.3 Oxygen

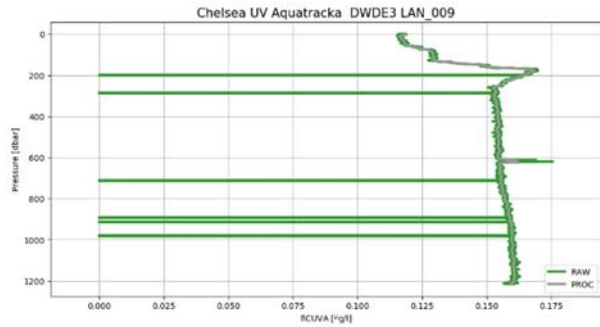
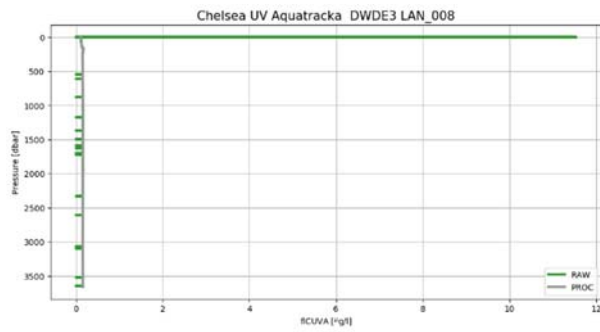
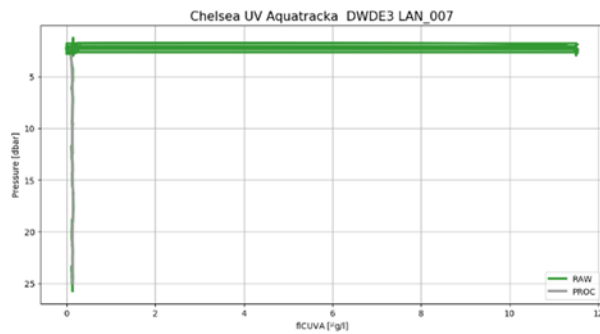
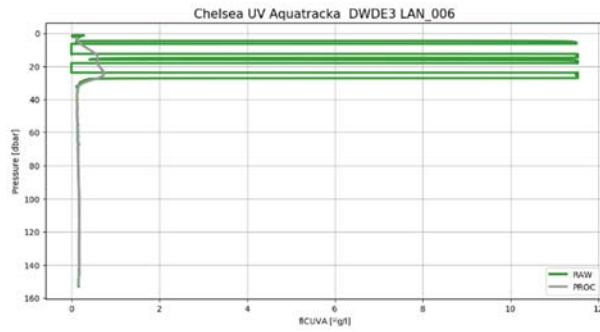
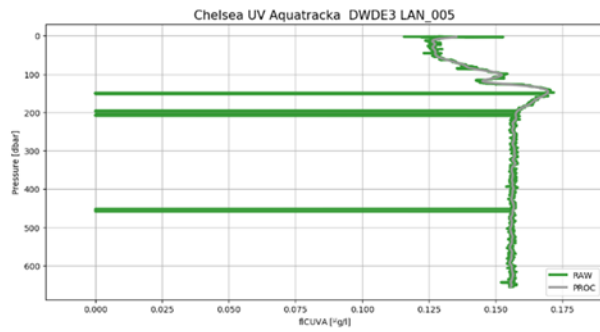


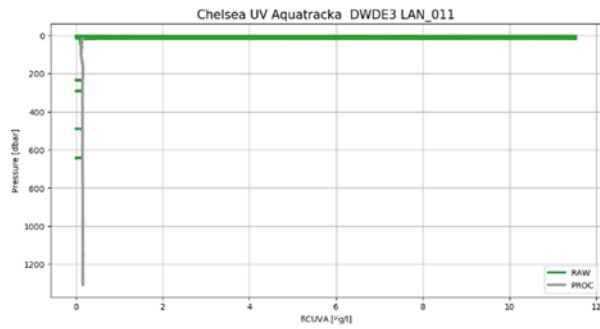
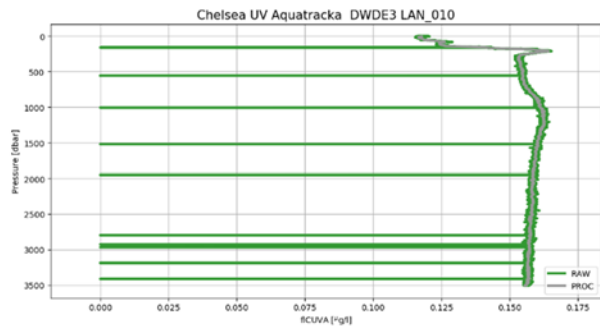




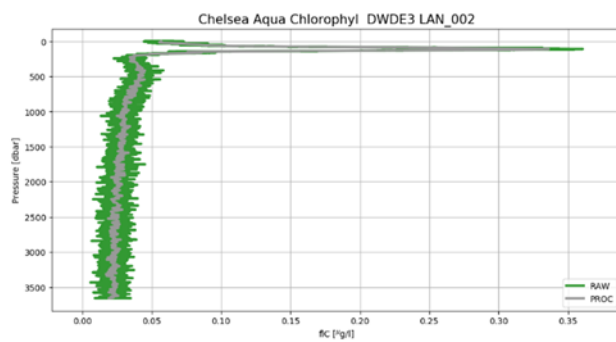
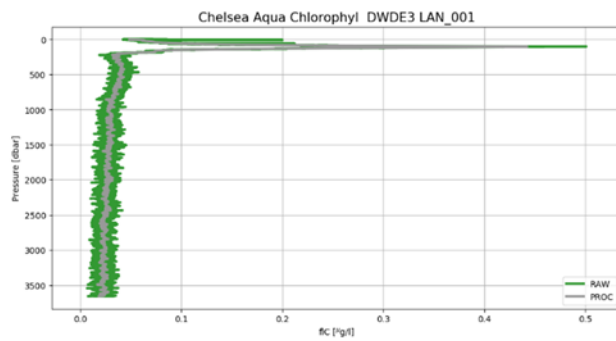
7.3.4 fICUVA Aquatracka

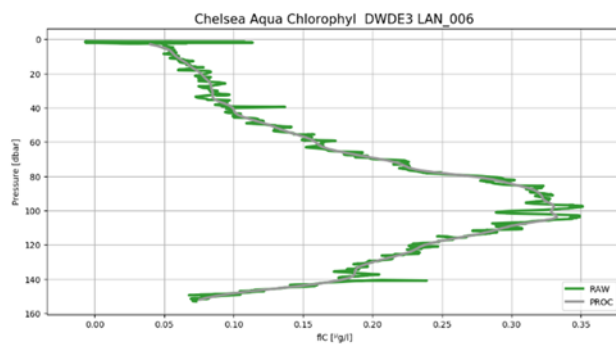
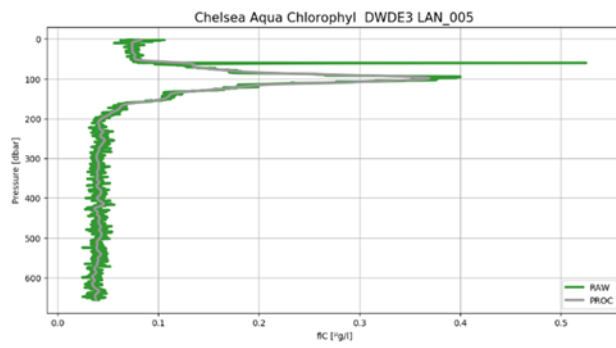
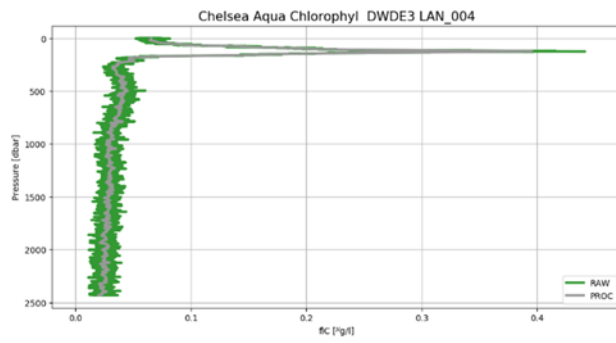
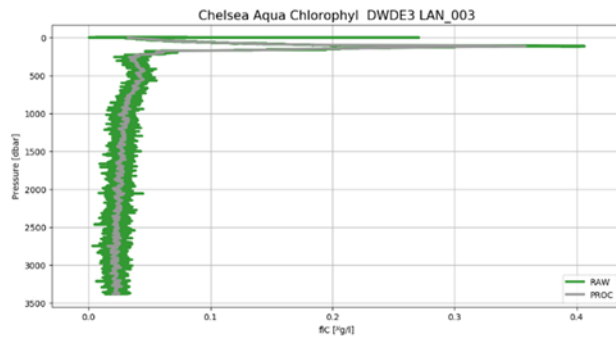


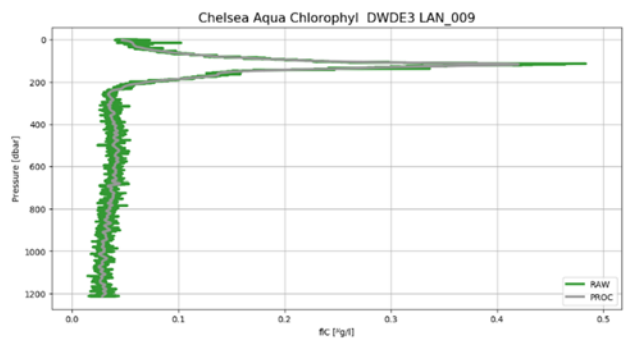
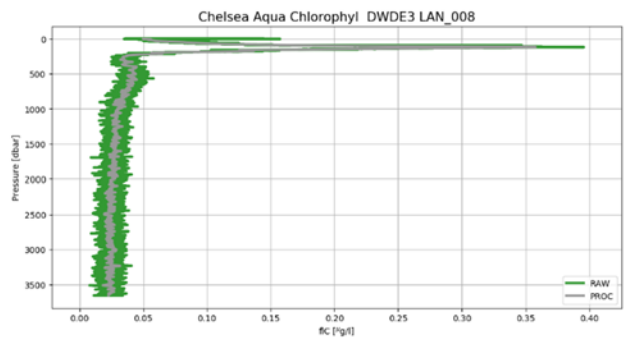
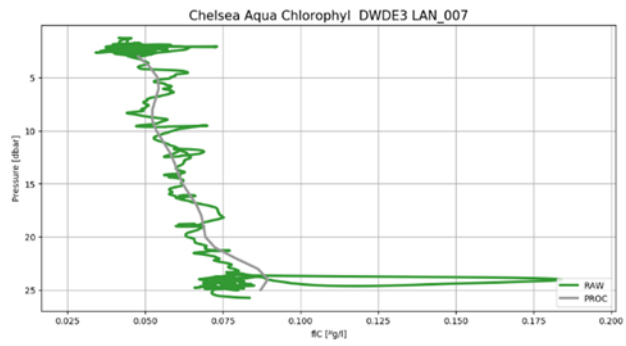


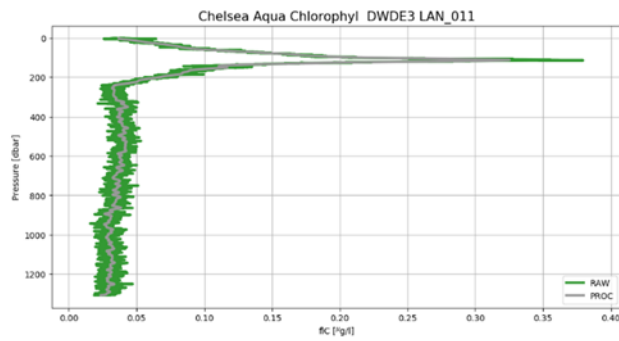
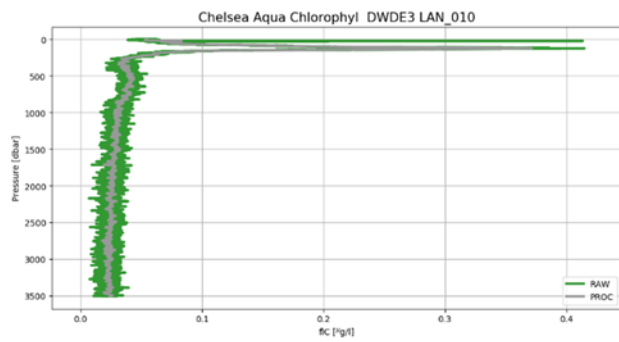


7.3.5 Chlorophyl-a aquatracka

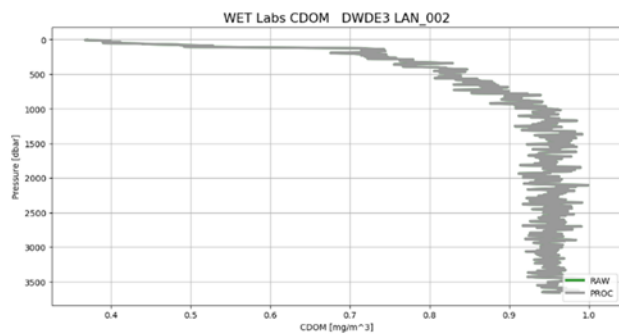
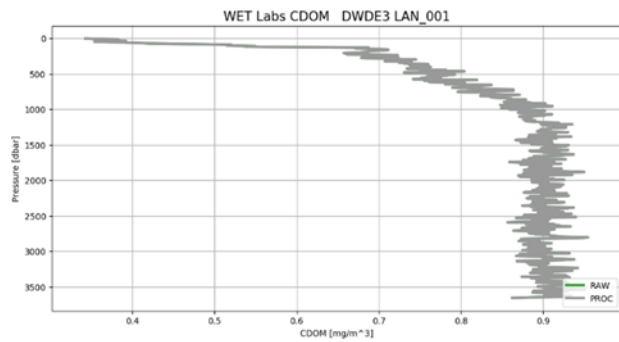


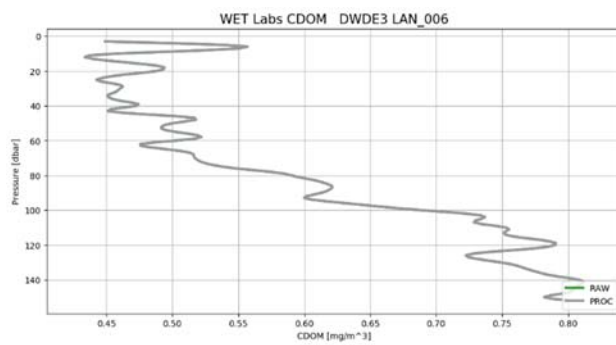
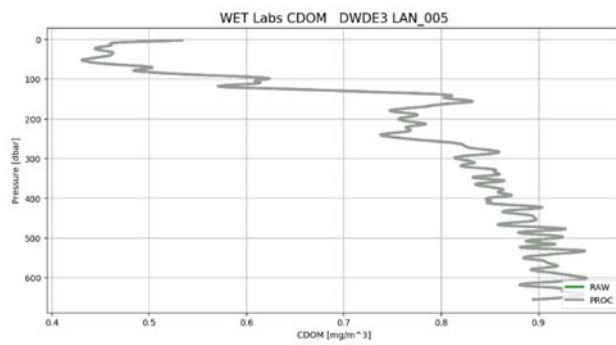
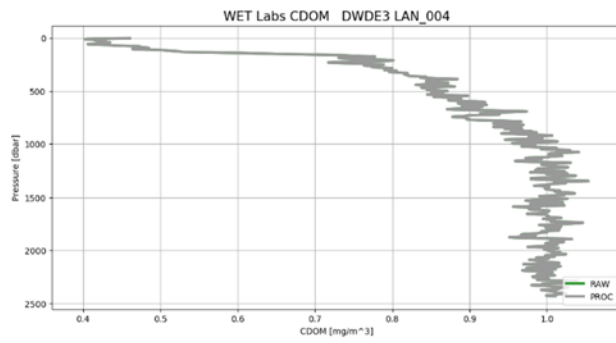
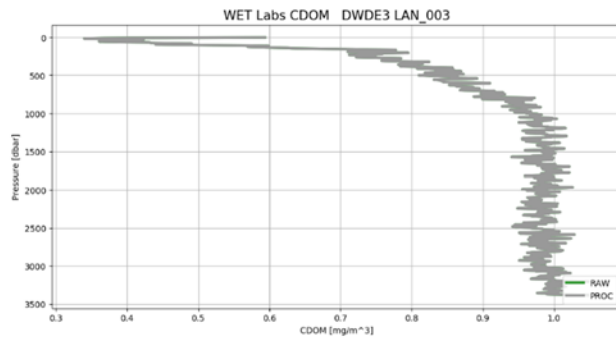


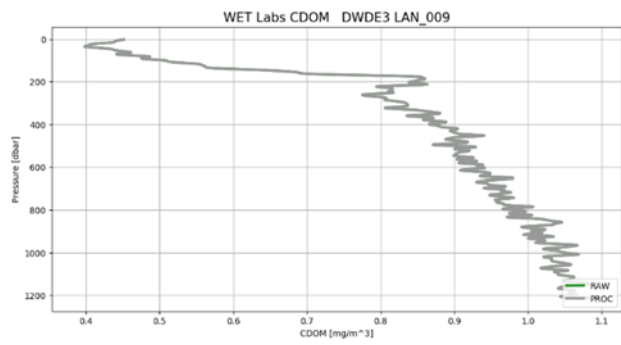
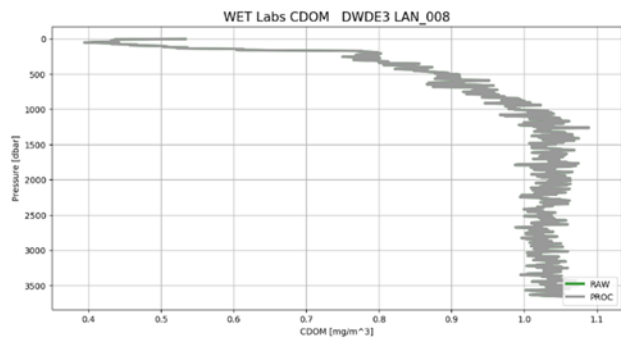
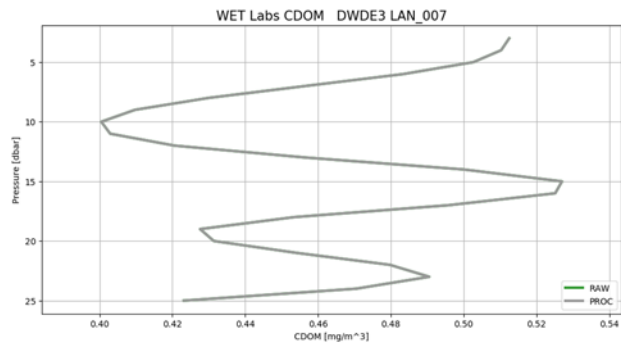


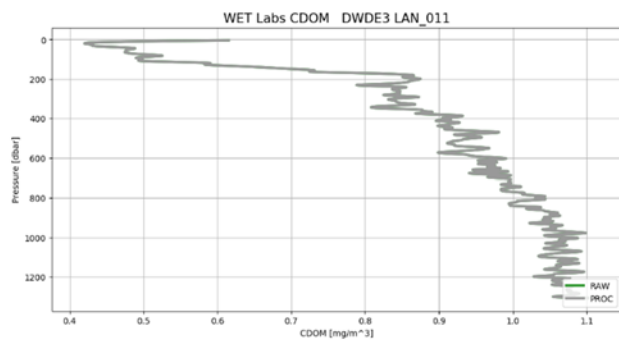
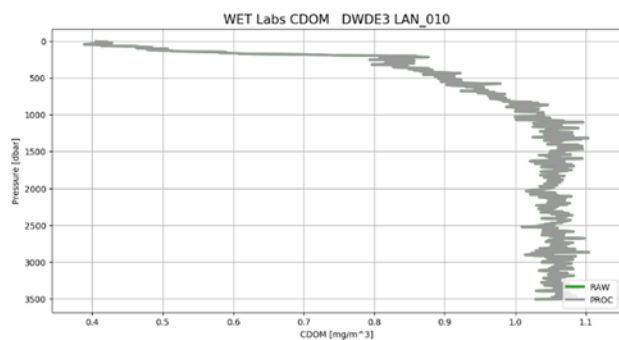


7.3.6 Wetstar CDOM

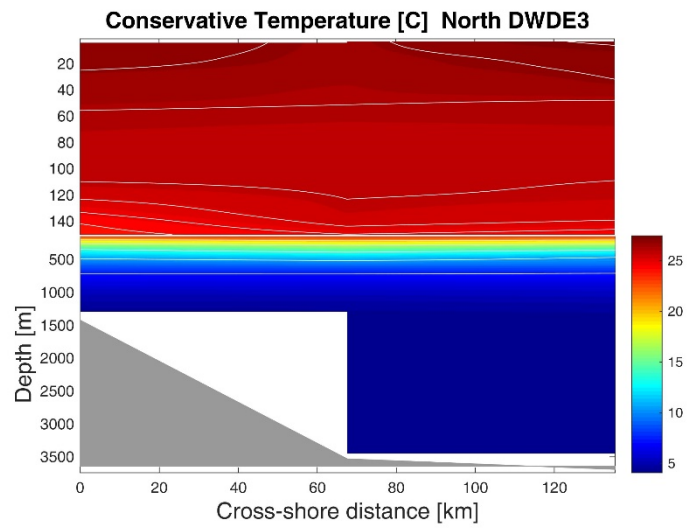
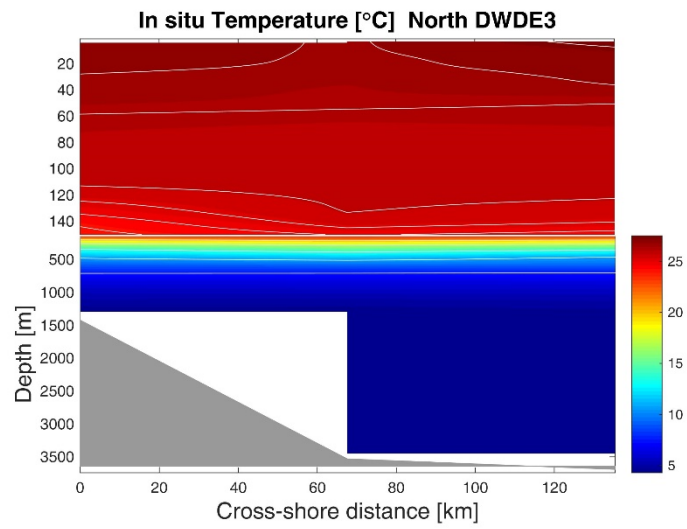


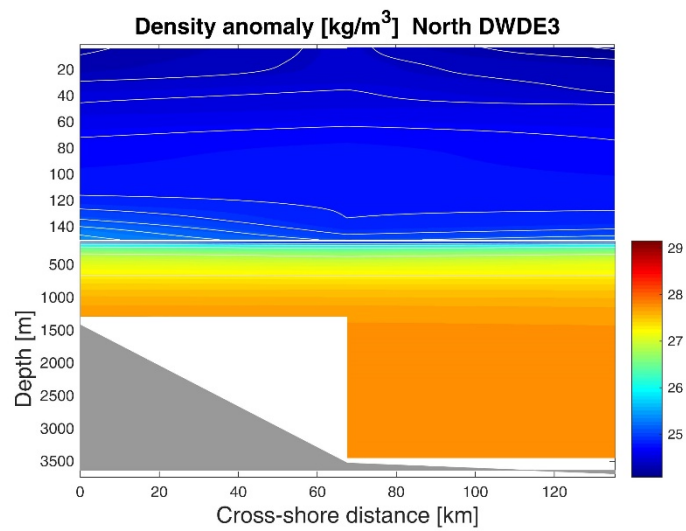
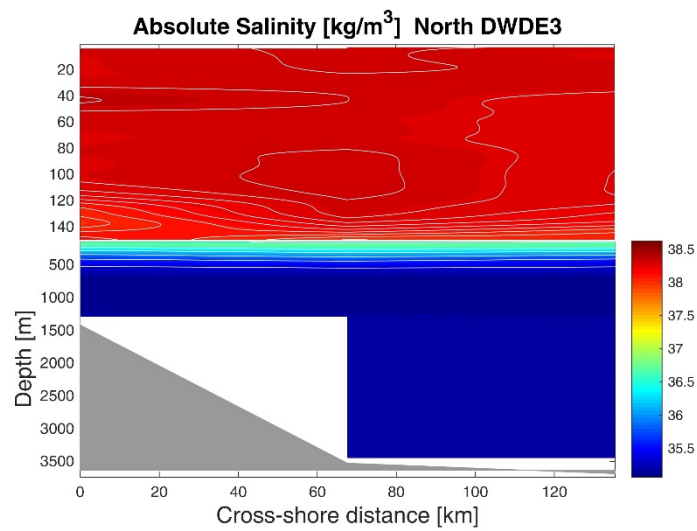
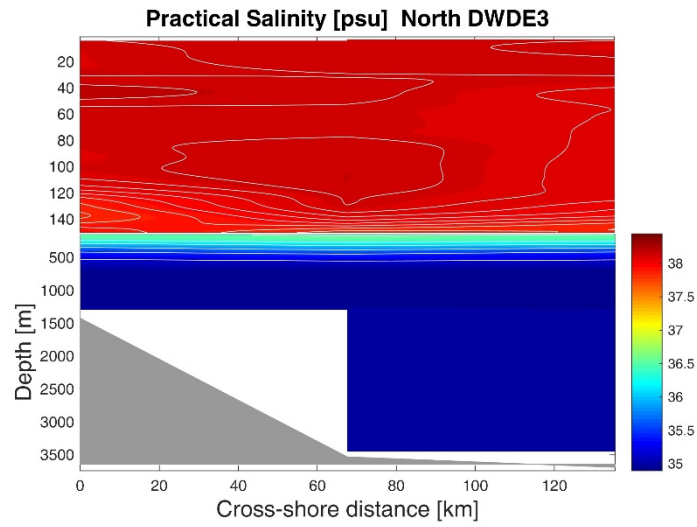


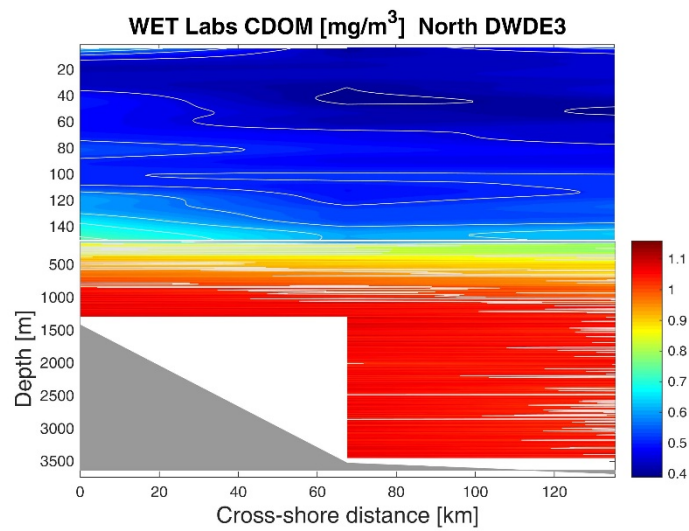
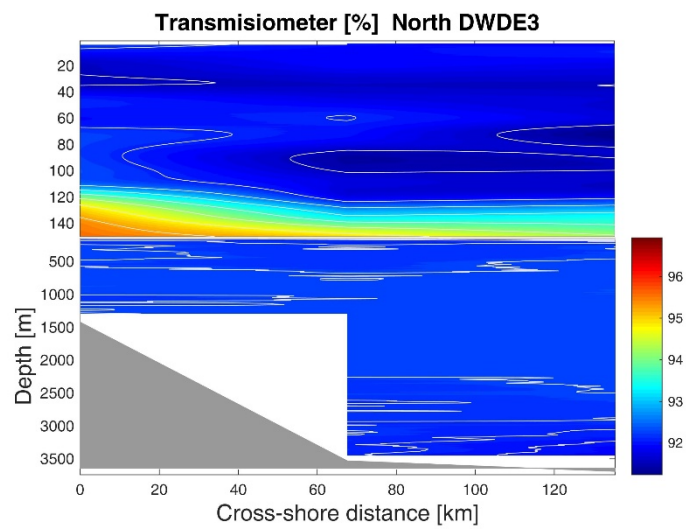
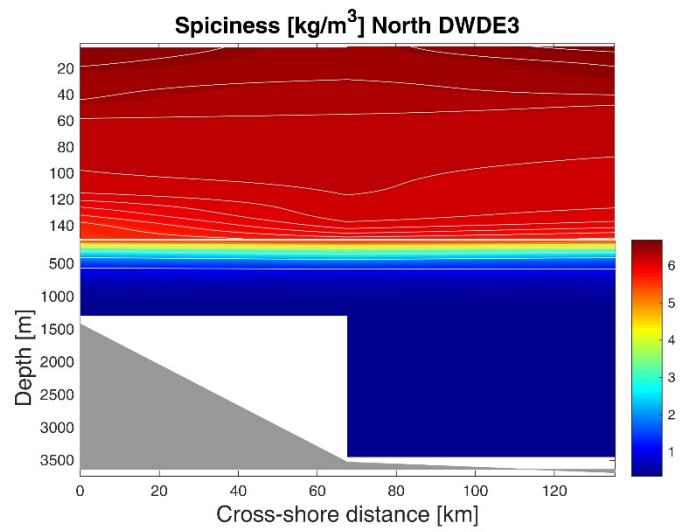


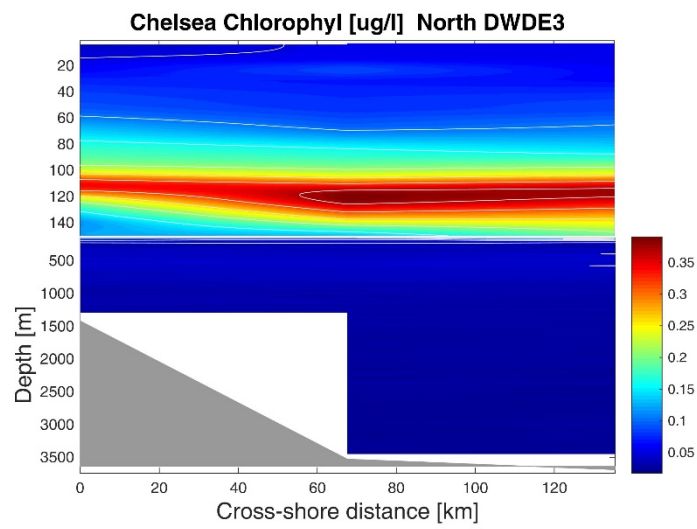
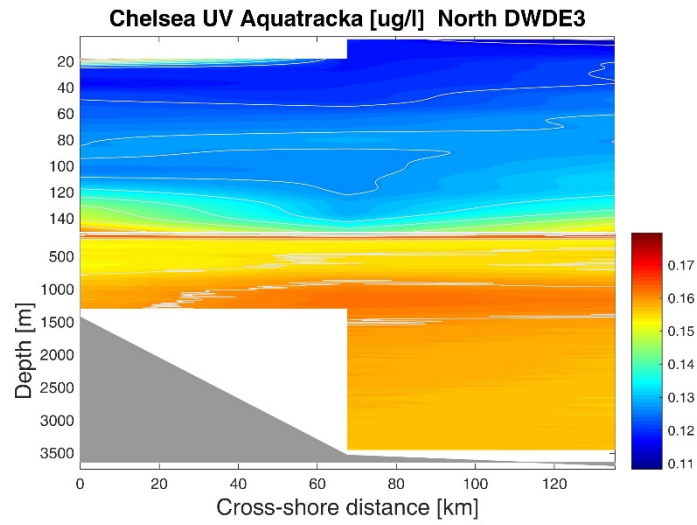


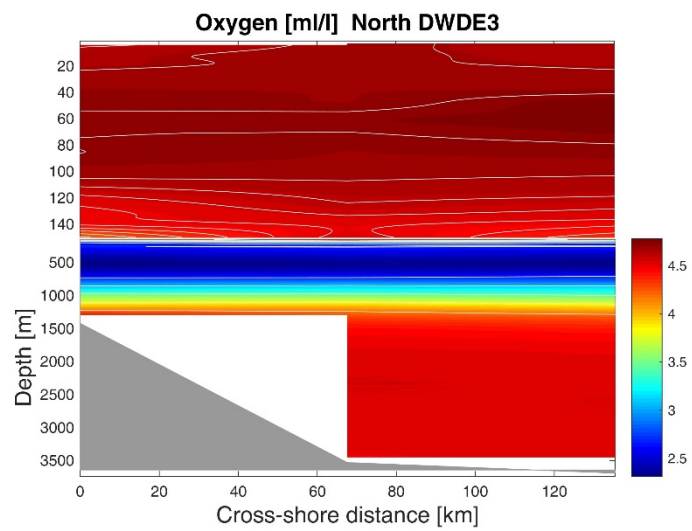
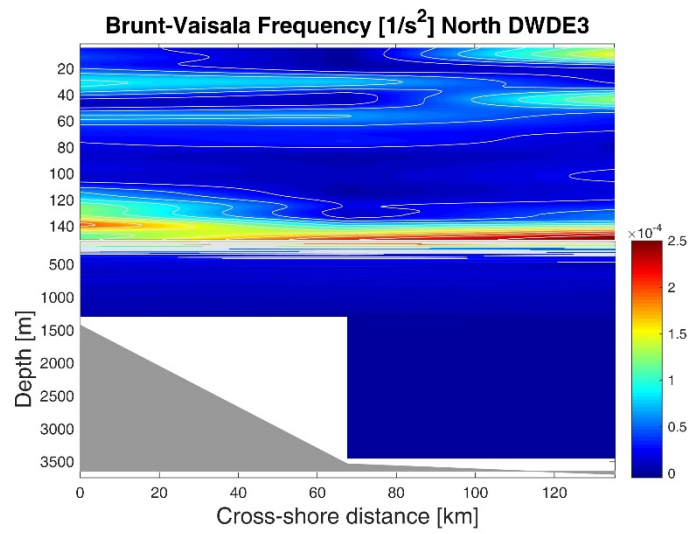
APPENDIX E: CTD CROSS SECTIONS

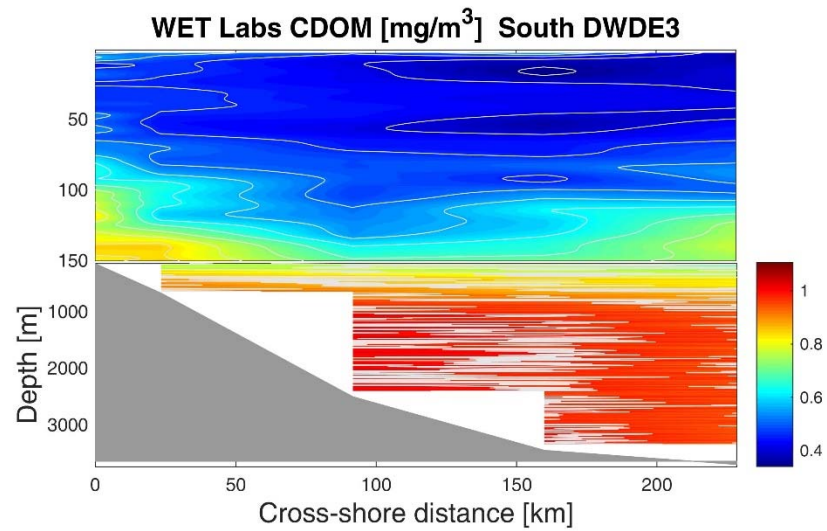
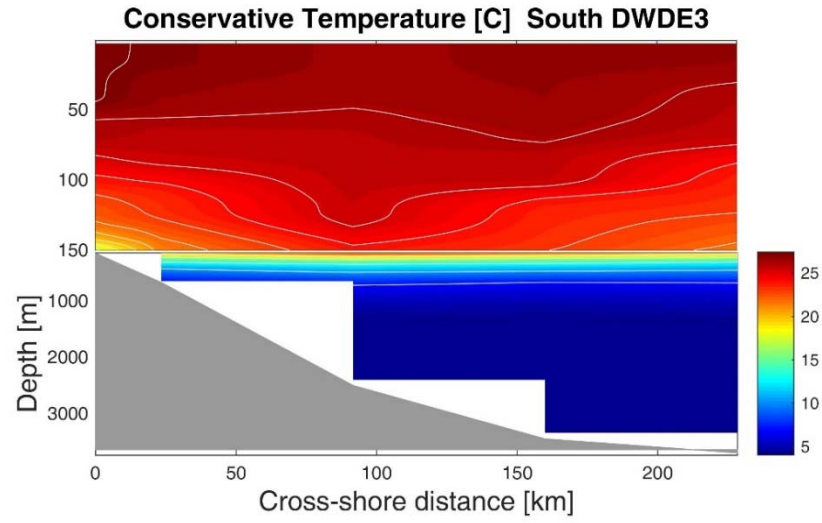
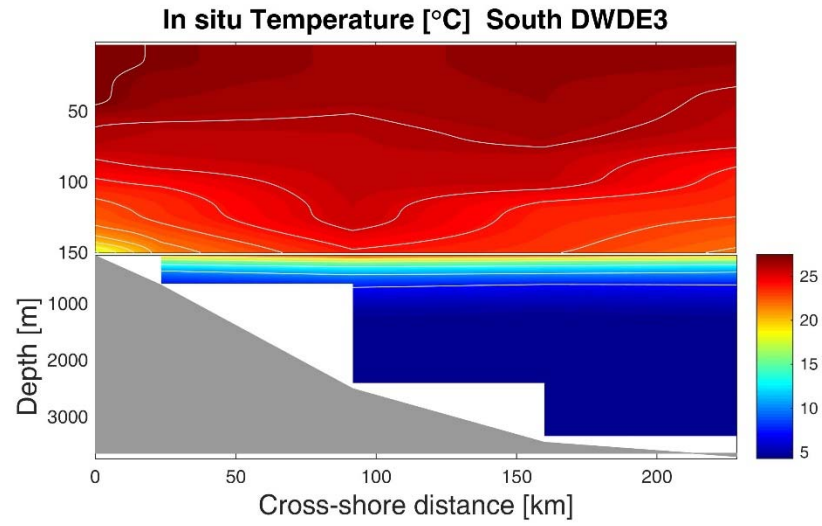


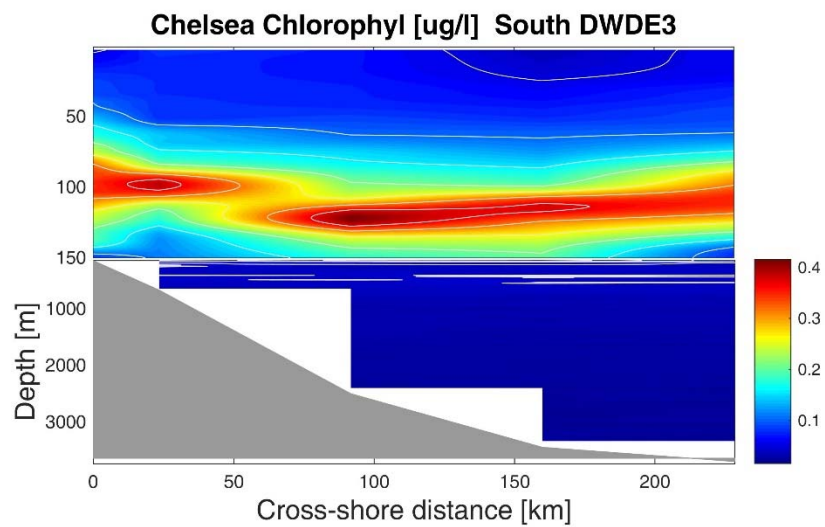
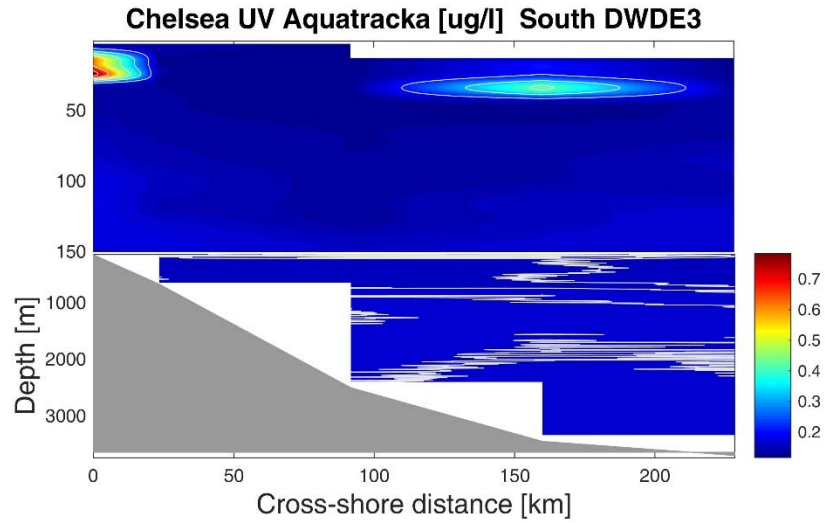
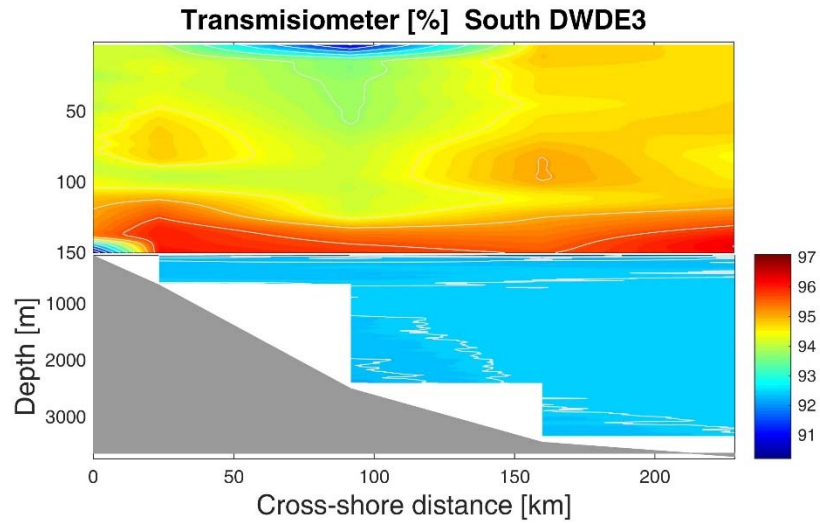


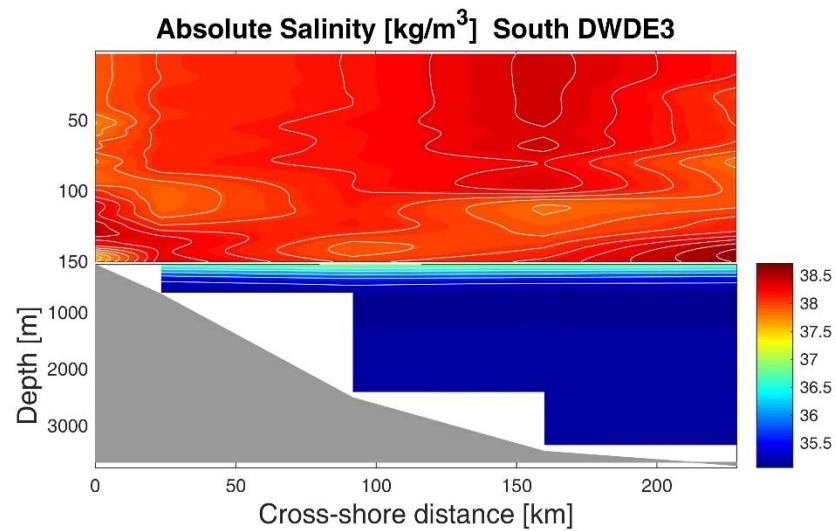
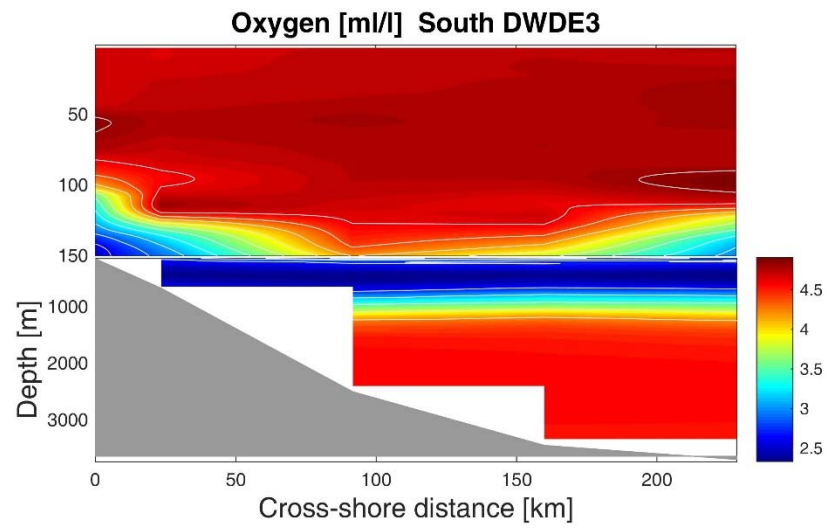
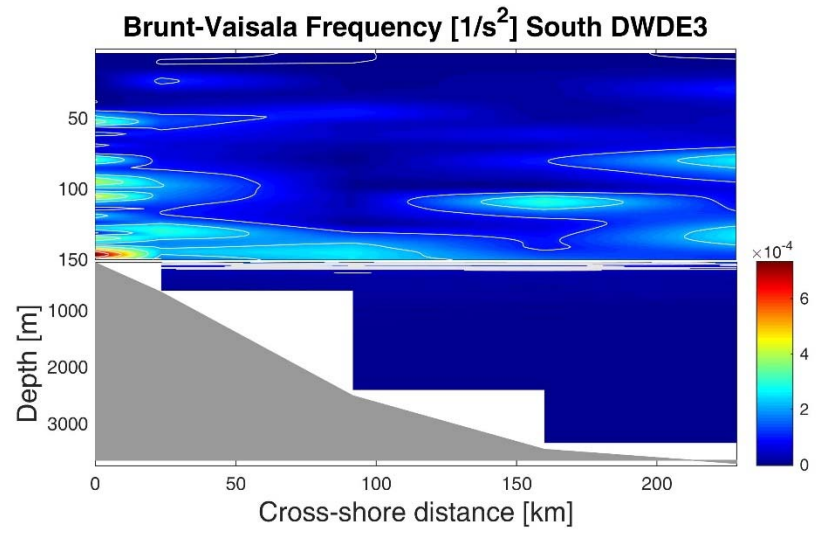


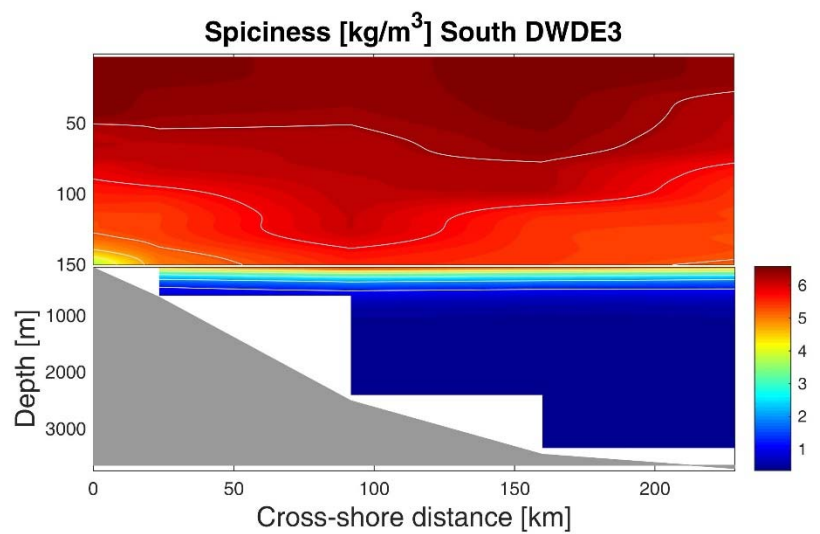
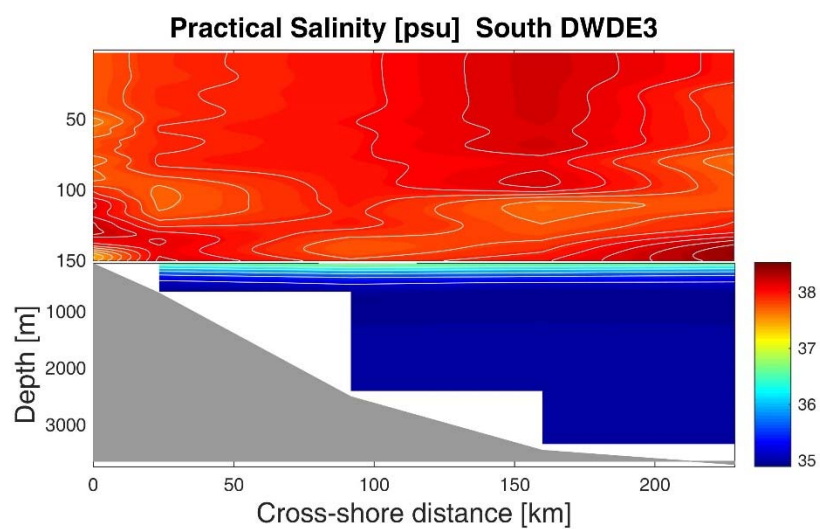
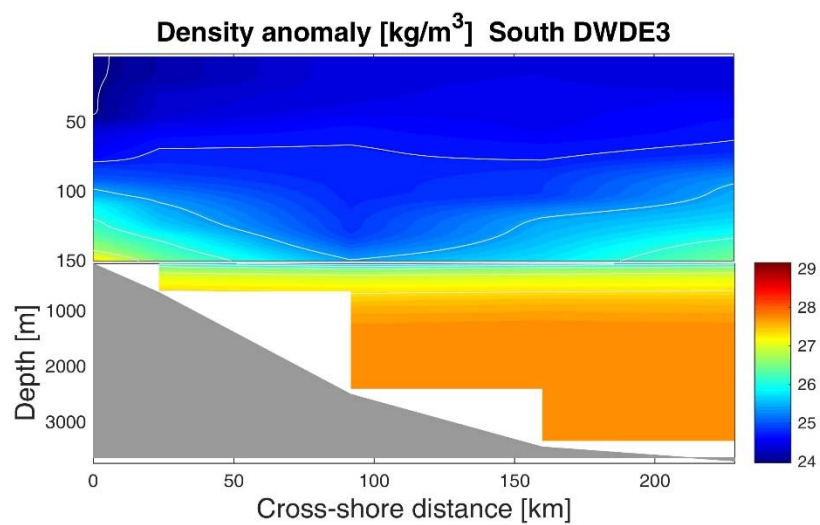




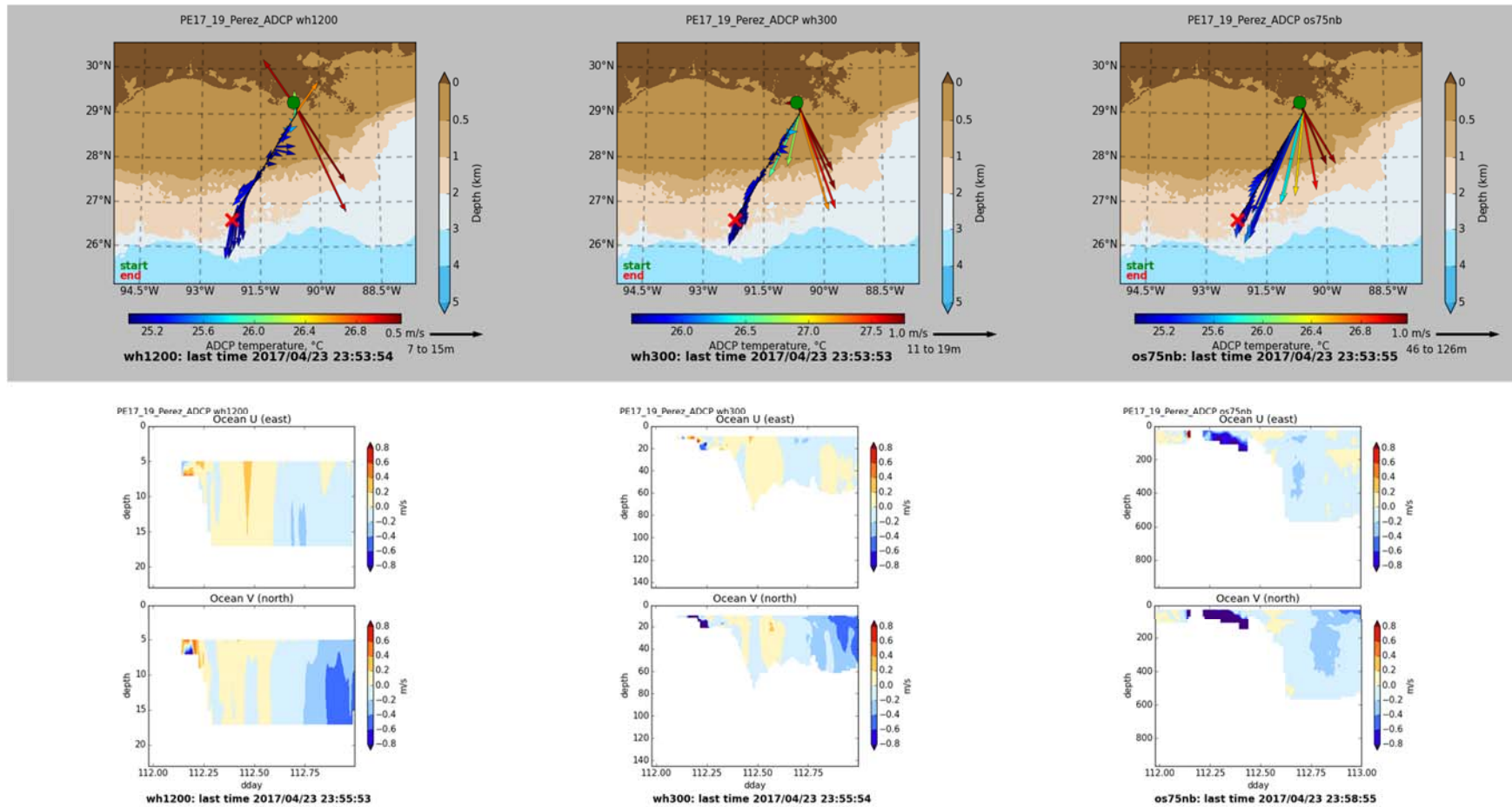


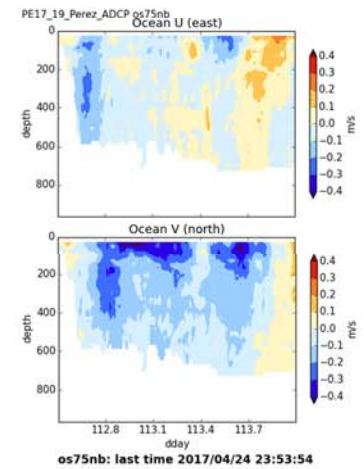
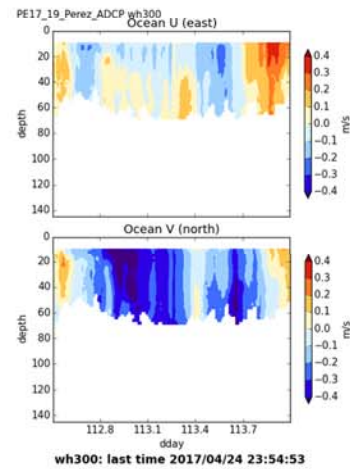
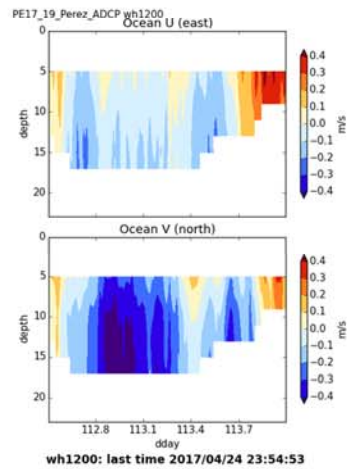
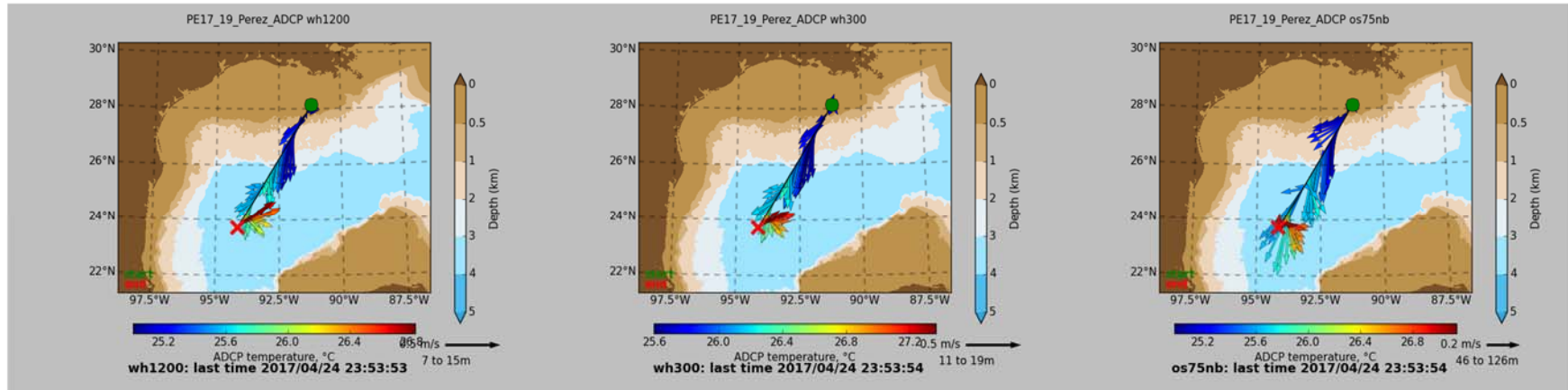


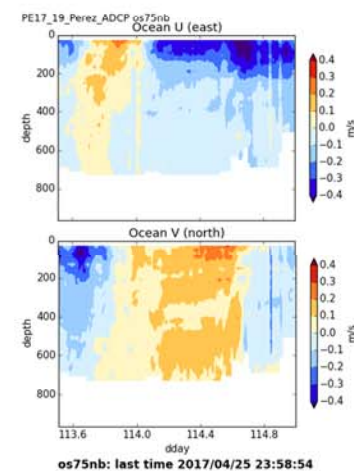
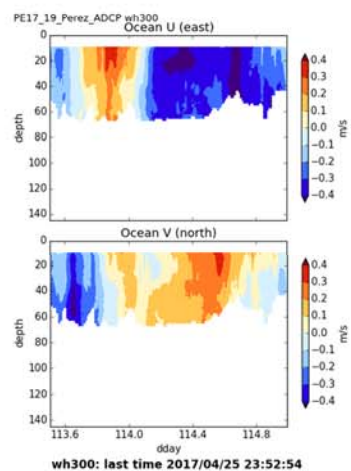
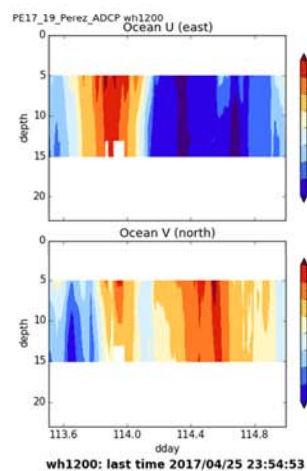
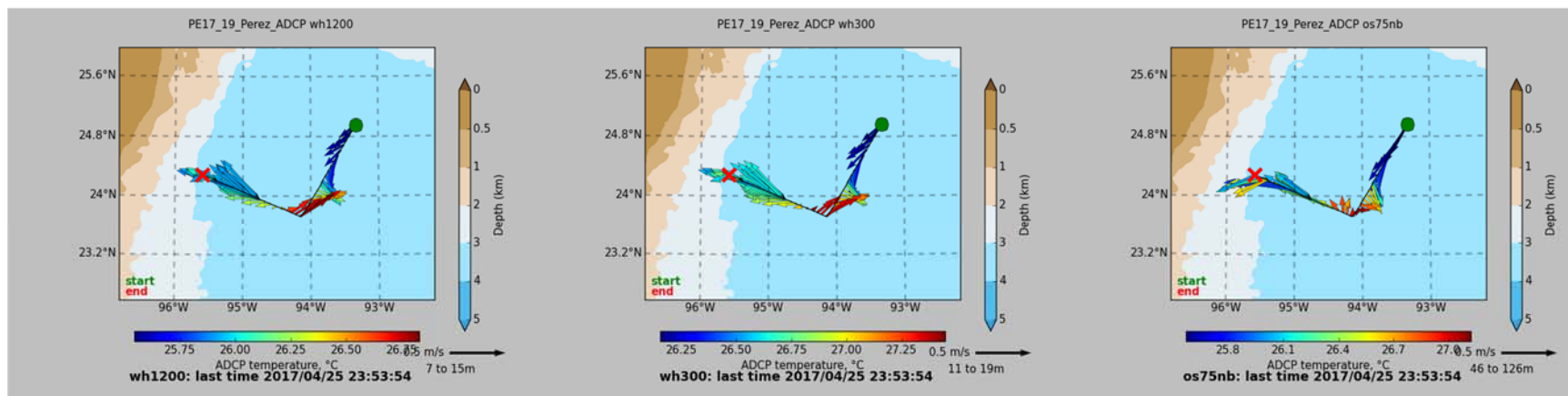


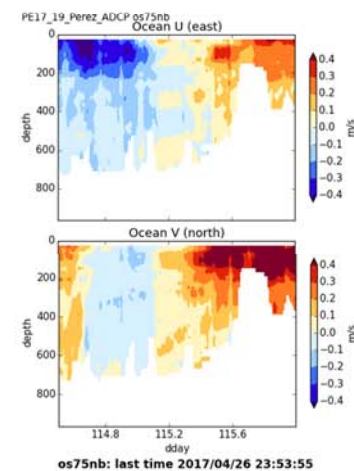
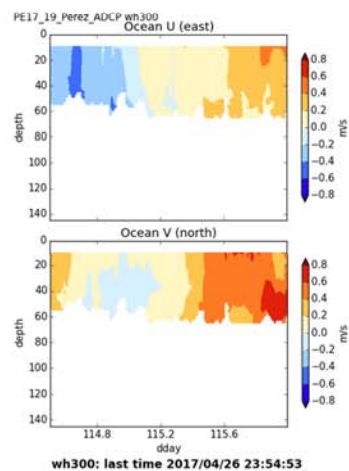
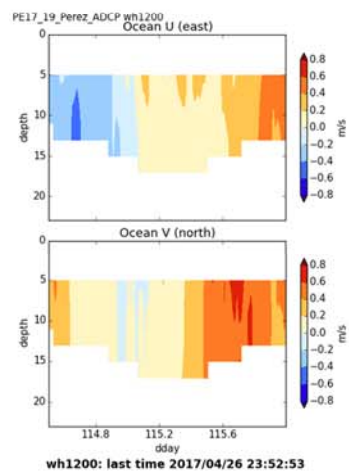
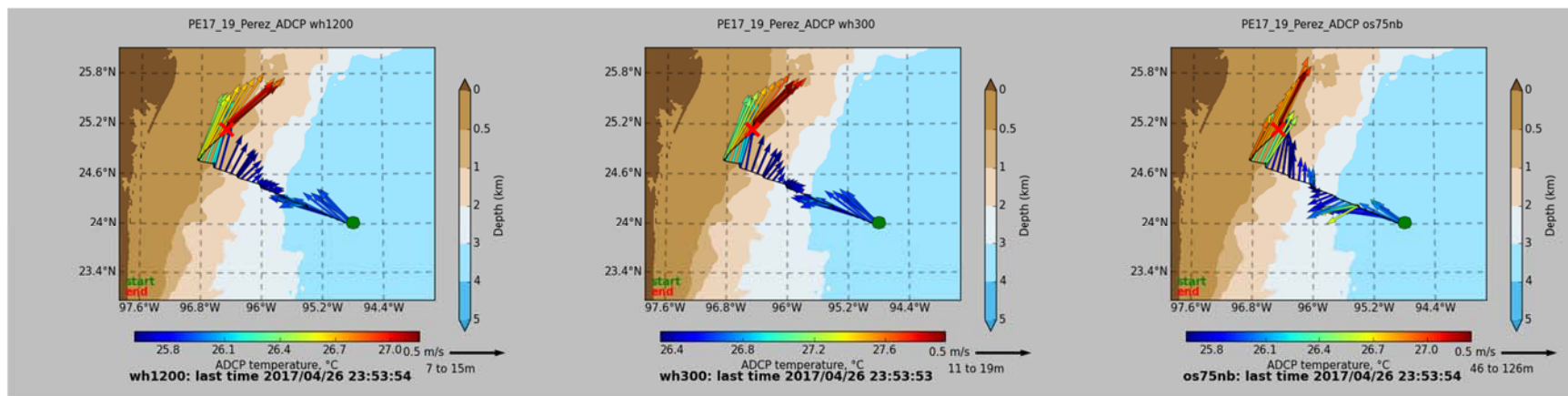


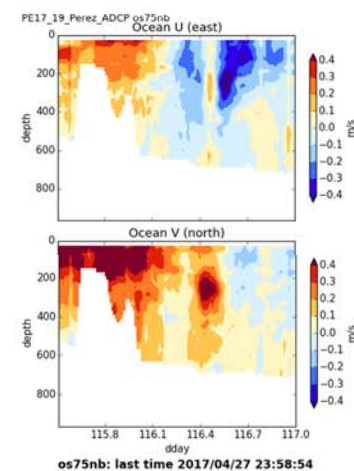
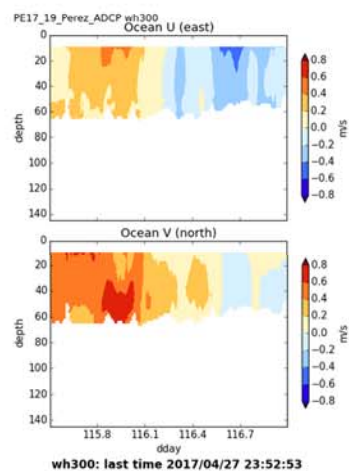
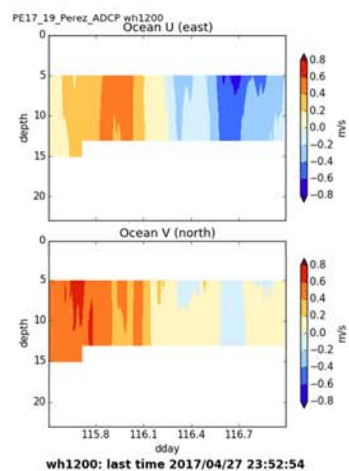
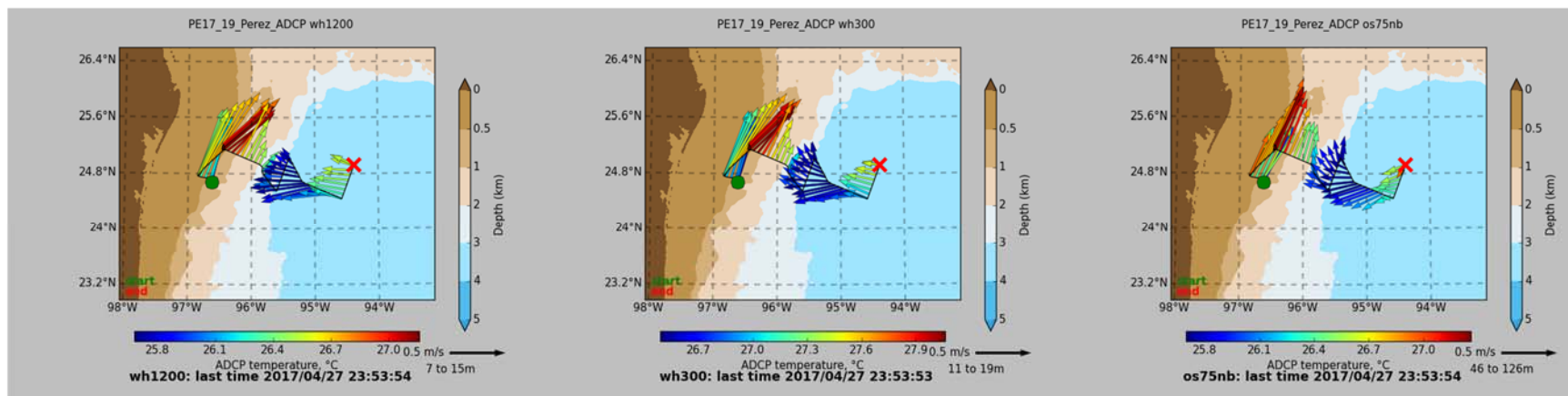
APPENDIX F. ADCP profiles.

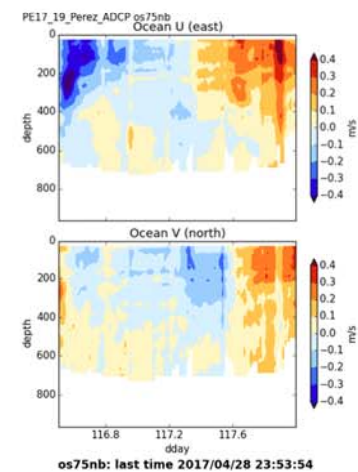
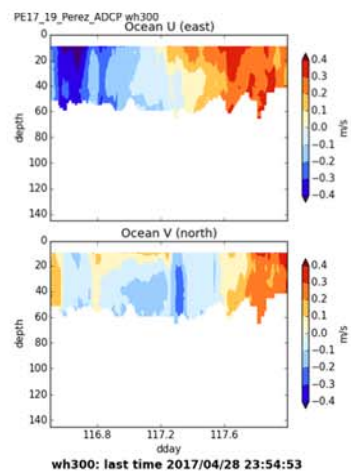
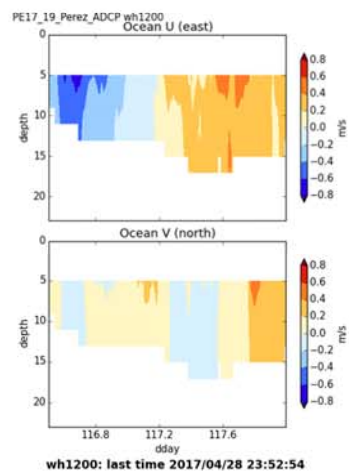
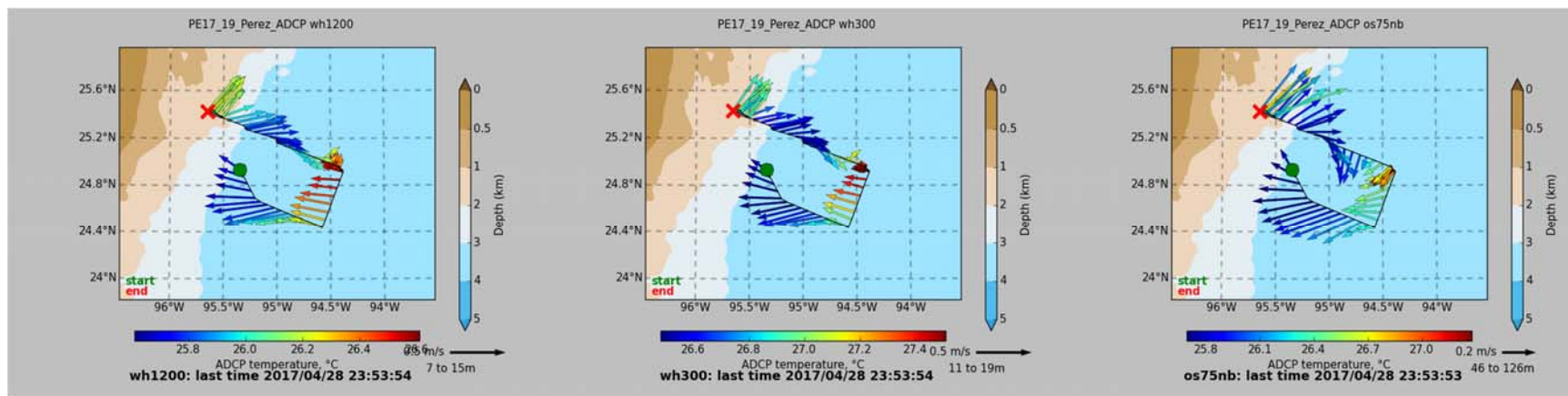


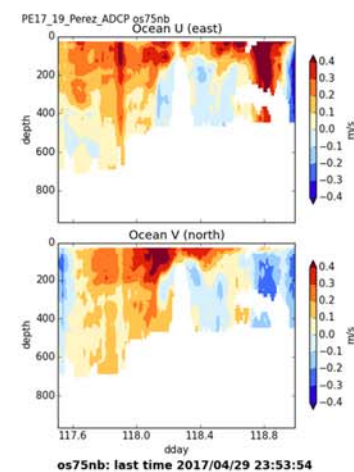
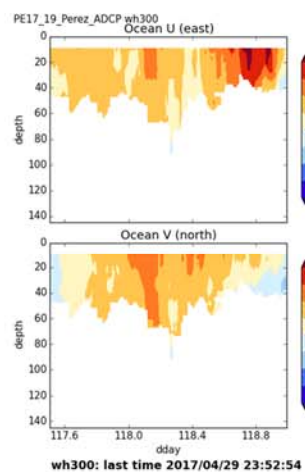
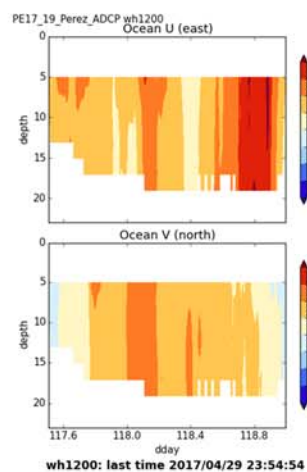
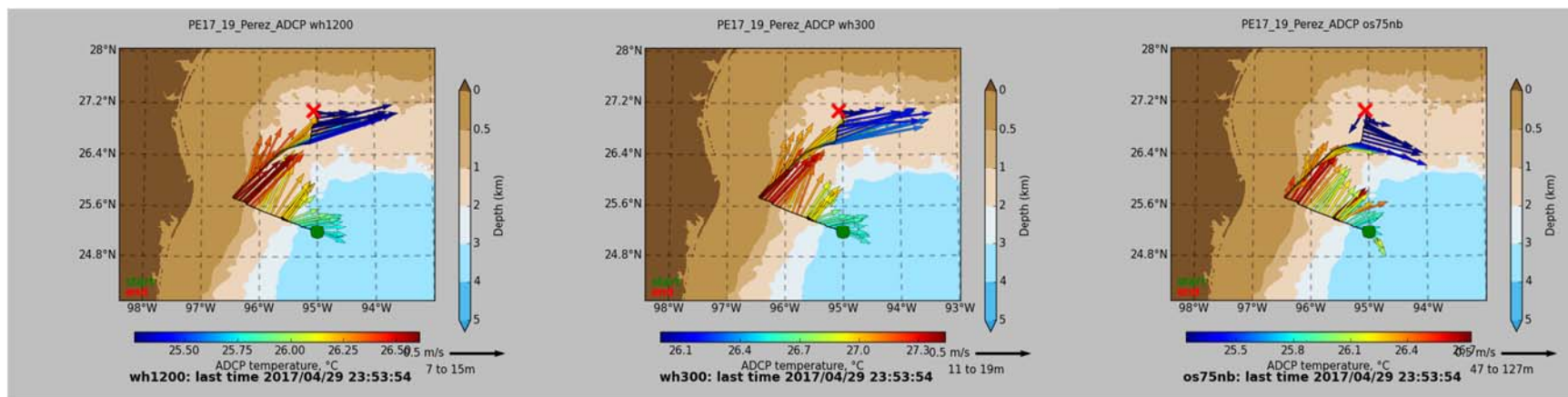


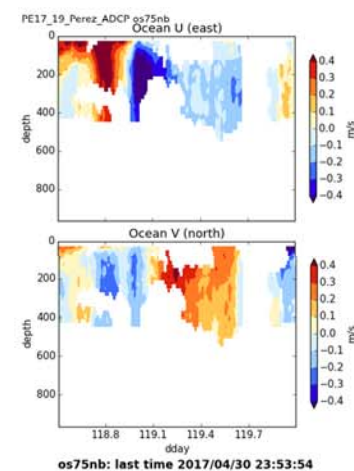
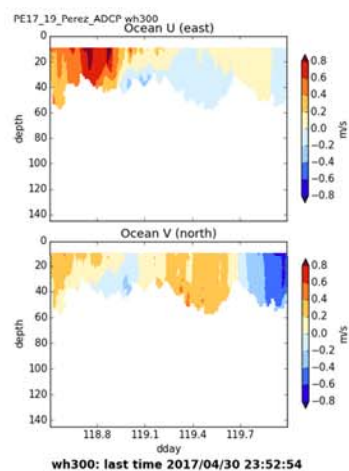
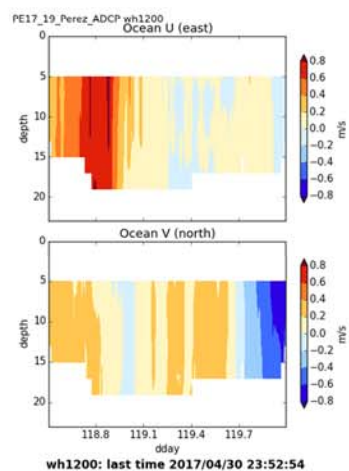
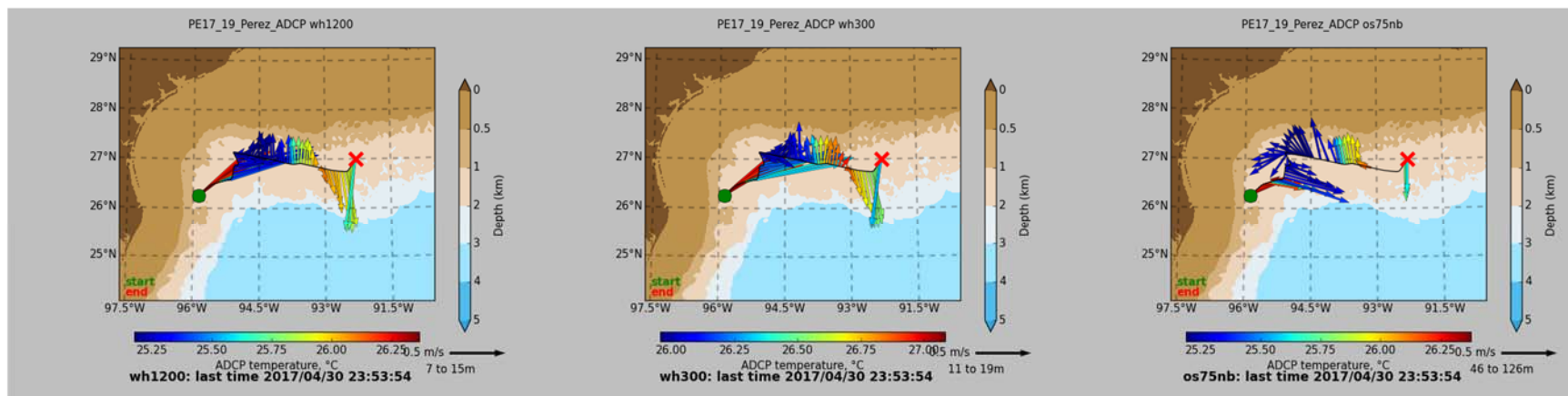


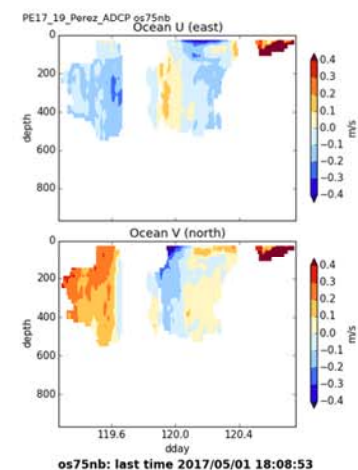
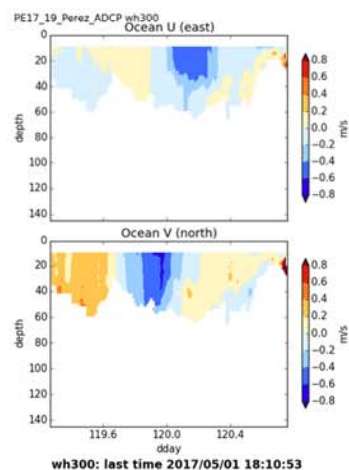
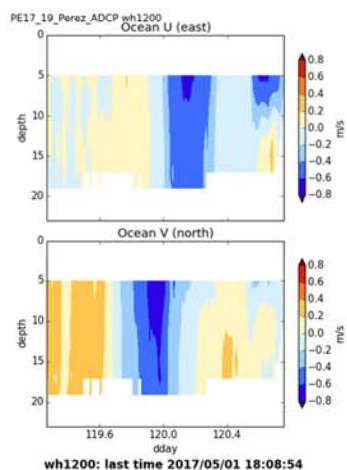
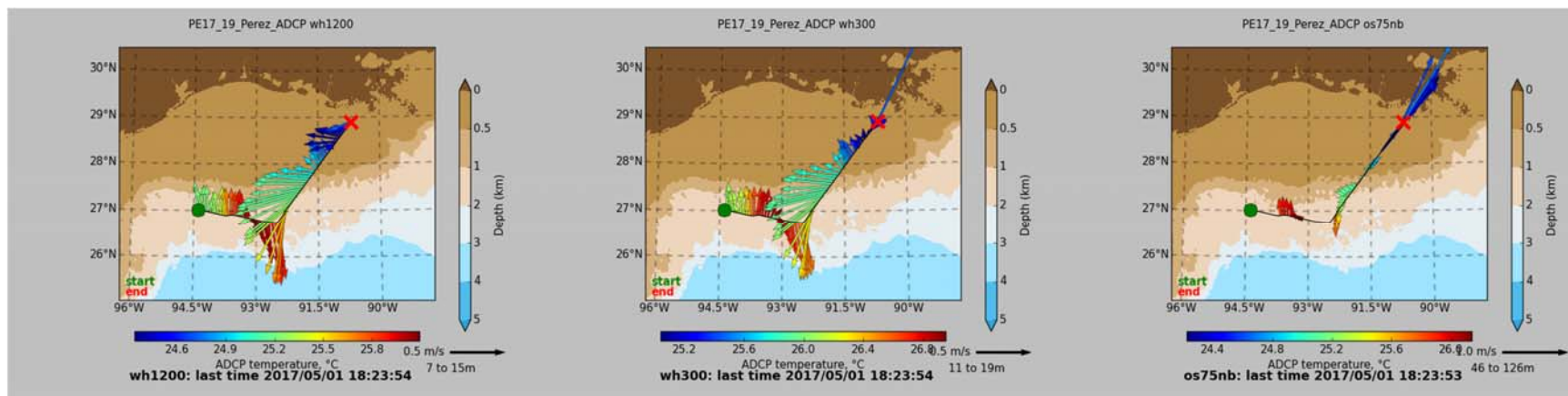














Este estudio es parte del proyecto 201441
"Implementación de redes de observación oceanográficas (físicas, geo-
químicas, ecológicas) para la generación de escenarios ante posibles
contingencias relacionadas a la exploración y producción de hidrocarburos
en aguas profundas del Golfo de México"
financiado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

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



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