September 2nd | 2010

Ryan Chouest Cruise 13 Cumulative Report

Period covered: 0134 08/27/2010 -0307 09/01/2010

349.584 - Nautical miles covered

Vessel science party:

Xiubin Qi (Xiubin.Qi@csiro.au), Stephane Armand (Stephane.Armand@csiro.au), Andy Revill (Andy Revill@csiro.au), Charlotte Stalvies (Charlotte.Stalvies@csiro.au), Rebecca Tedford (rebecca.tedford@gmail.com), Curtis Walker (CWalker@entrix.com), Tim MacEwen (TEM@cctechnol.com) , Bobby Patrick (@cctechnol), Brett Bundick (.@cctechnol.com), Mathew Baham (Mathew.Baham@cctechnol.com)

Contact details:

+ 1 337 761 9830 – Sat phone
+ 1 337-761-9830 – Broadband phone ship office 1
+ 1 337-761-9827 – Broadband phone ship office 2
+ 1 337-761-9826 - Broadband phone ship bridge

Cumulative Cruise notes:

The *Ryan Chouest* cruised about 350 nautical miles, from 08/27/10 to 09/01/10, for the completion of Cruise 13. The complete route is shown in Figure 1.

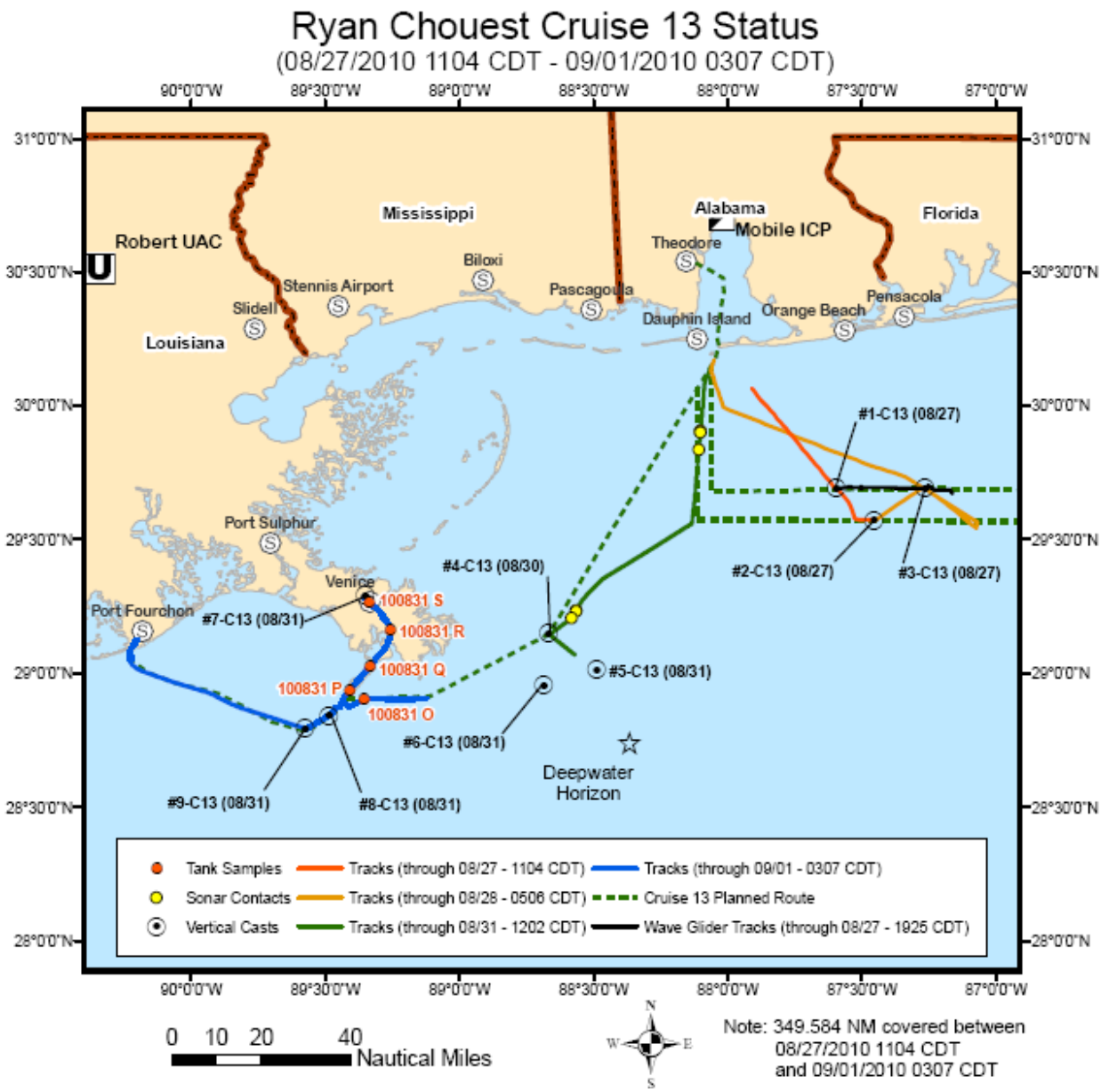

Figure 1: Planned and actual route course of the Ryan Chouest cruise 13 plotted between 08/27 – 09/01. The bull's-eye represents vertical cast locations. The yellow filled dots represent recorded acoustical contacts. The red dots represent tank water samples.

08/27

The *Ryan Chouest* sailed on the planned cruise 13 route and headed southeast towards the water glider deployment sight (Figure 1). Once the Water glider was deployed the ship began a zig-zag pattern to insure maximum distance travelled in the rough seas. The Water glider's eastward movement was tracked while the crew completed two vertical casts spaced approximately every 20nm. During this time the echo sounder survey and the underway fluorometry system continued to collect data.

At each vertical cast station, two additional water samples were collected. One sample was collected directly from the tank connected to the underway pump right before cast and one surface sample was collected with a bottle attached to a pole.
A new monitor was installed next to the sensor monitor to provide real time echo sounder image and water depth.

08/28
The *Ryan Chouest* modified the Cruise 13 route due to rough seas by tacking between the original planned route and headed to the next planned vertical casting localities. The Water glider's eastward movement was tracked while the crew continued with the vertical casts spaced approximately every 20nm, the echo sounder survey, and the underway fluorometry system (Figure 1). Due to rough seas we decided to head back to port retrieving the wave gliders in route that night.

08/28-8/30
We remained in Theodore at port awaiting the return of more favorable seas.

08/31
The *Ryan Chouest* left Theodore when the weather conditions appeared more favourable and began the remainder of planned route of Cruise 13 to Port Fouchon. The rough seas prohibited the deployment of the underway pump. Collection of the echo sounder survey data and vertical casts continued. Two sensors from CSIRO and one sensor from Liquidr were calibrated with carbazole solution and oil/water extract.

09/01
The *Ryan Chouest* followed the planned cruise 13 route up and down the southwest pass of the Mississippi River delta ending at Port Fouchon. The underway pump was deployed during the beginning of the cruise track until pump problems arose. Collection of the echo sounder survey data and vertical casts continued until we reached Port Fouchon. Additionally, 5 tank water samples were collected along the Mississippi River route. Due to the incremental weather and recorded wave heights of up to 10 feet the hydrocarbon towed array experienced some difficulty in deployment and data collection.

In this report we present a detailed summary of results of the cruise 13.

Science results and preliminary interpretation:

Fluorometry results

Fluorometry measurements indicate very low to lower-medium inferred hydrocarbon concentrations for the Chelsea and Trios sensors (Figures 2-3). In most places baseline levels were measured by the Chelsea and Trios fluorometers. The Trios sensor, however, detected slightly higher than baseline levels in Mobile Bay and across the Mississippi passes. In contrast, the Contros sensor showed medium levels of inferred hydrocarbons throughout the cruise track.
Whilst the fluorometry results were low there are small trends within the data (not shown).

Surface Observations

Photo 3 shows a picture taken on 09/01, ~5nm away from the mouth of the Mississippi river showing relatively sharp boundary between the green and brown water. The brown water may be due to the sediments coming from the Mississippi river.

Vertical casts

9 vertical casts were taken during this report period (Figures 1, Figures 4-12). The last three casts were taken within the Mississippi River and along the south western pass of the delta in addition to 5 tank water samples. Overall the sensor readings are in the lower range of the average sensor outputs indicating low levels of Hydrocarbon outputs. The Chelsea and the Trios show slightly increased responses to waters close to the sea surface.
Cast4 and Cast5 both fluorometers displayed gradual increase along the water column up to the surface, while in Cast 6 the inferred PAH concentration was relatively constant from surface down to 10m depth. Cast 7 was performed in fresh water at Venice with the lowest conductivity and minimum fluorometer reading along the water column.

A total of 48 water samples were collected during Cruise 13. These include 23 vertical cast samples and 15 surface samples either collected from the underway tank or with a bottle attached to a pole.

The Hydrocarbon concentrations of the 23 vertical cast samples are summarized and presented in Figure 4 to Figure 12. The concentration of naphthalene plus is obtained by adding up the concentrations of all detectable poly aromatic hydrocarbons from GCMS results. The average naphthalene plus concentrations lie in the range of 0.10-0.30 ppb.
To decide the background level of the HC introduced by the vertical cast sampling system, after each cast a water sample was collected directly from the sea surface with a bottle attached to a pole. The total aromatic concentrations of these water samples were generally lower than detectable levels. This suggests that the trace levels of aromatic hydrocarbons detected in the vertical cast samples mainly come from the sampling hose.

The GCMS analysis of the five water samples collected along the Mississippi river from the underway tank also yielded background level of BTEX (<0.1ppb, mainly from the underway hose) and total naphthalene plus under detection limit.

EK-60 Echosounder results

During the cruise there were a total of 7 echo sounder contacts identified (Figures 13-16). All contacts were identified during the last leg of the trip near and in the Mississippi River delta. Most were described as bottom to mid surface contacts, with the precise origin of these contacts being unknown.

Science Operations:

Fluorometer measurements were logged and observations of sea-surface conditions were made throughout the cruise. Vertical fluorometry and CTD casts sample the upper 30 m and are taken approximately every 20 nautical miles. We continue to perform liquid-liquid extractions on seawater samples and analyze the extracted material by GCMS. The overall trends in the Chelsea and Trios fluorometer and the AW40 volatile sensors results how an expected increase in hydrocarbon concentrations towards the surface. The conductivity and dissolved oxygen concentration through the water column is fairly constant. The temperature increases towards the surface are also reflect a similar

trend to that of hydrocarbon concentration. (Figure 5, 6). The EK-60 echo sounder is continuously collecting data to evaluate the seabed and water column for methane seeps. The Wave glider was successfully deployed at the first casting site and continuously collected fluorometry and CTD data until retrieval.

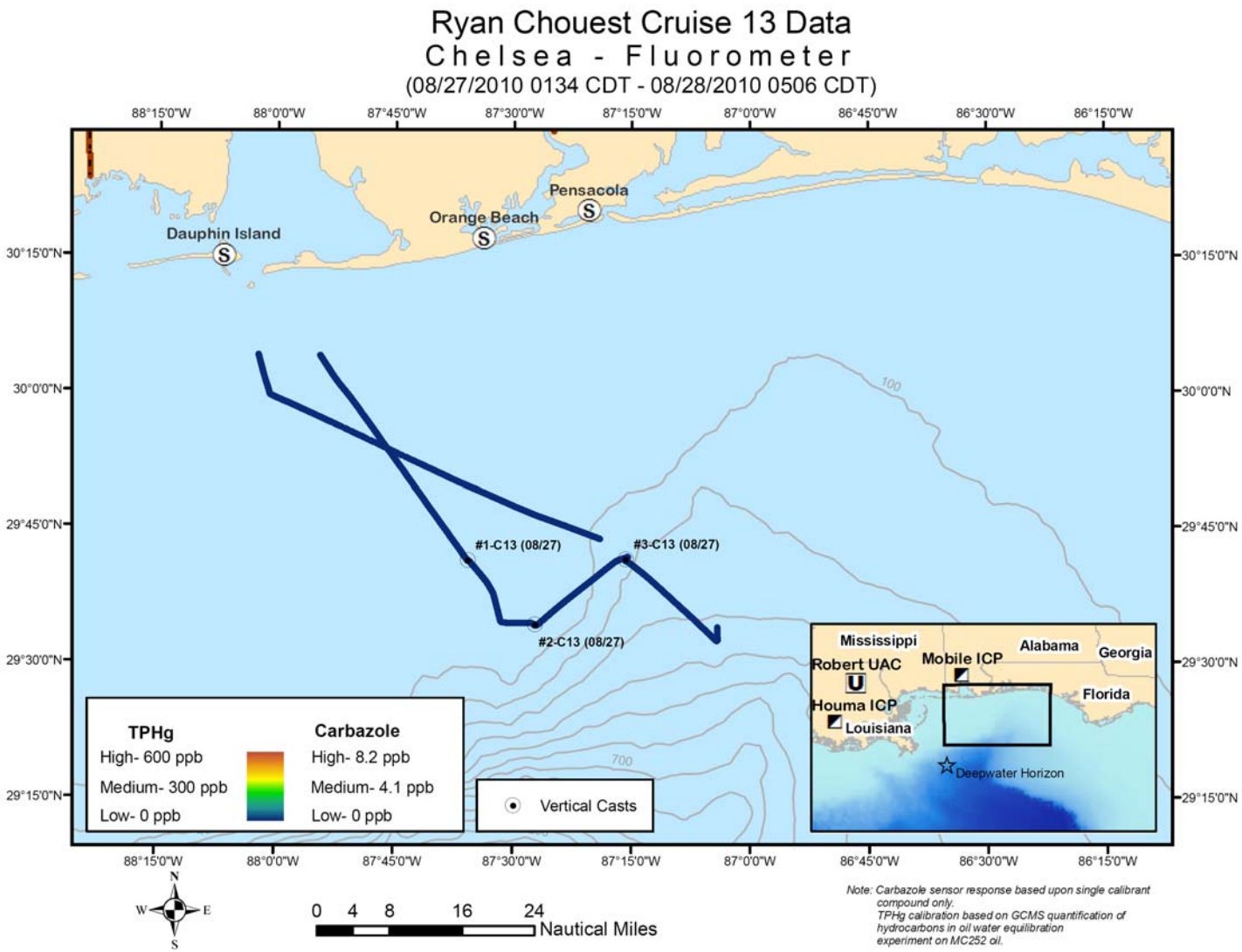

Figure 2. Chelsea fluorometer results plotted with location on cruise track 13. Breaks in data occur when either data quality is poor or the systems were turned off due to pump problems.

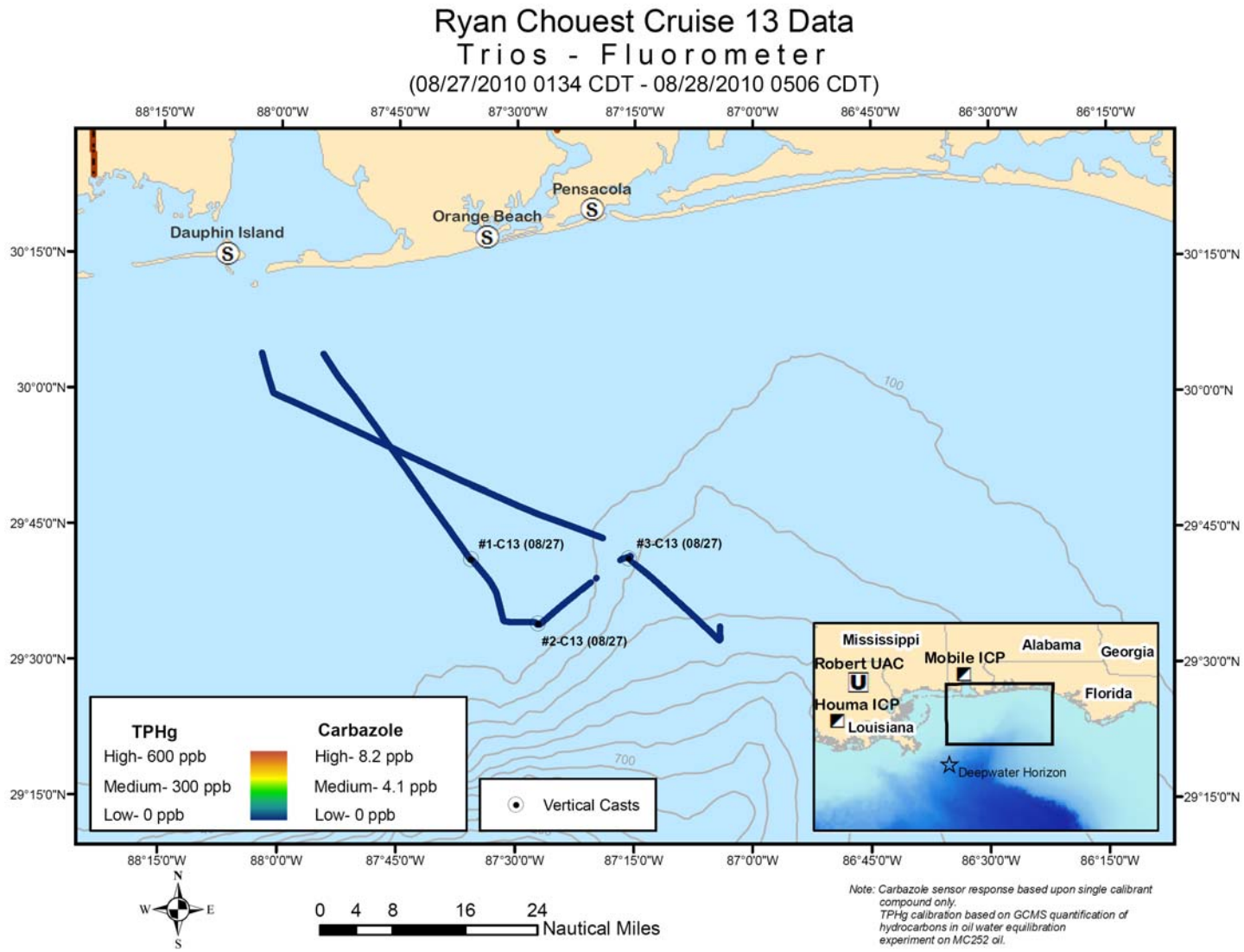

Figure 3. Trios fluorometer results plotted with location on cruise track 13. Breaks in data occur when either data quality is poor or the systems were turned off due to pump problems.

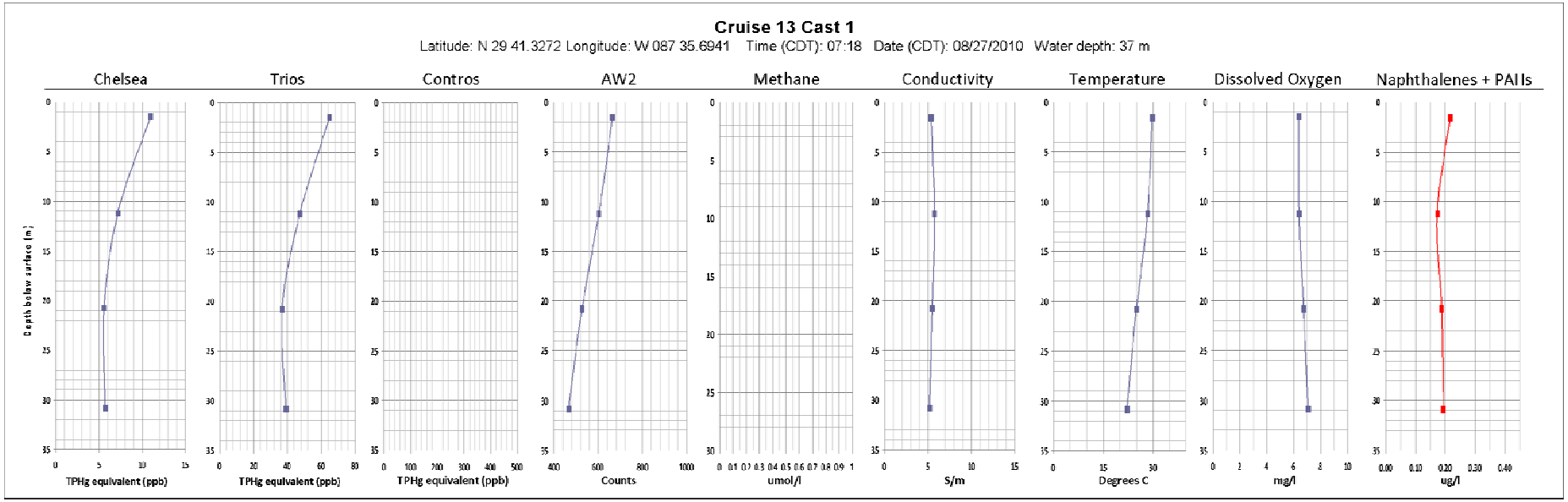

Figure 4. The results obtained for Cruise 13 vertical cast 1 (#1-C13) down to 31 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface

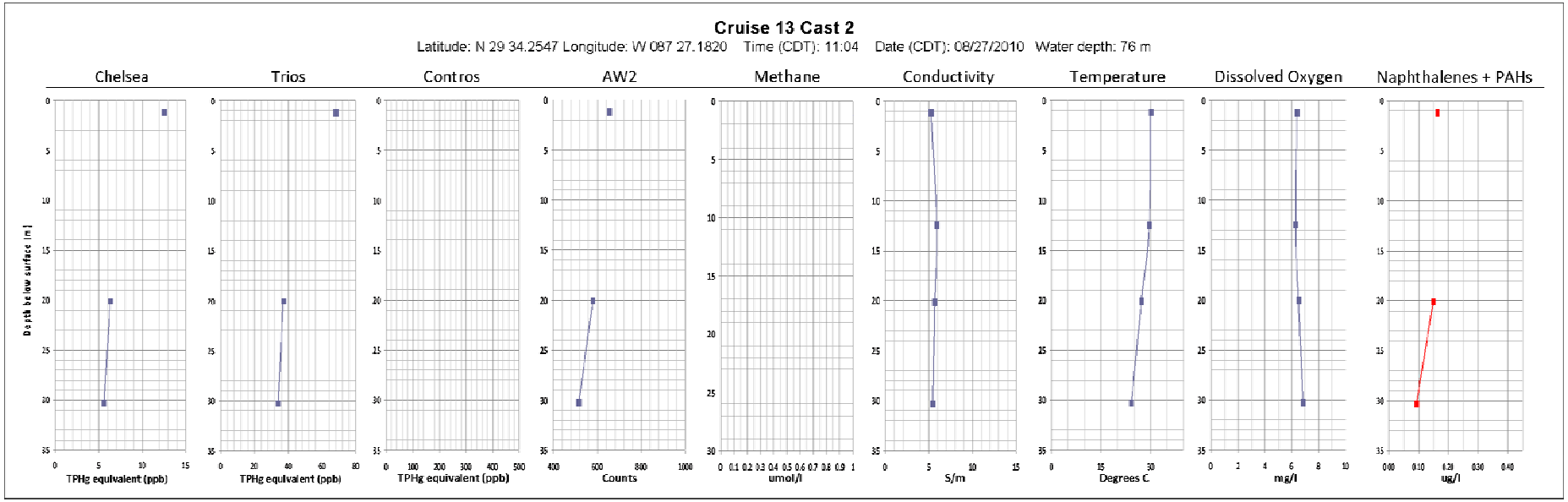

Figure 5. The results obtained for Cruise 13 vertical cast 2 (#2-C13) down to 30 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface

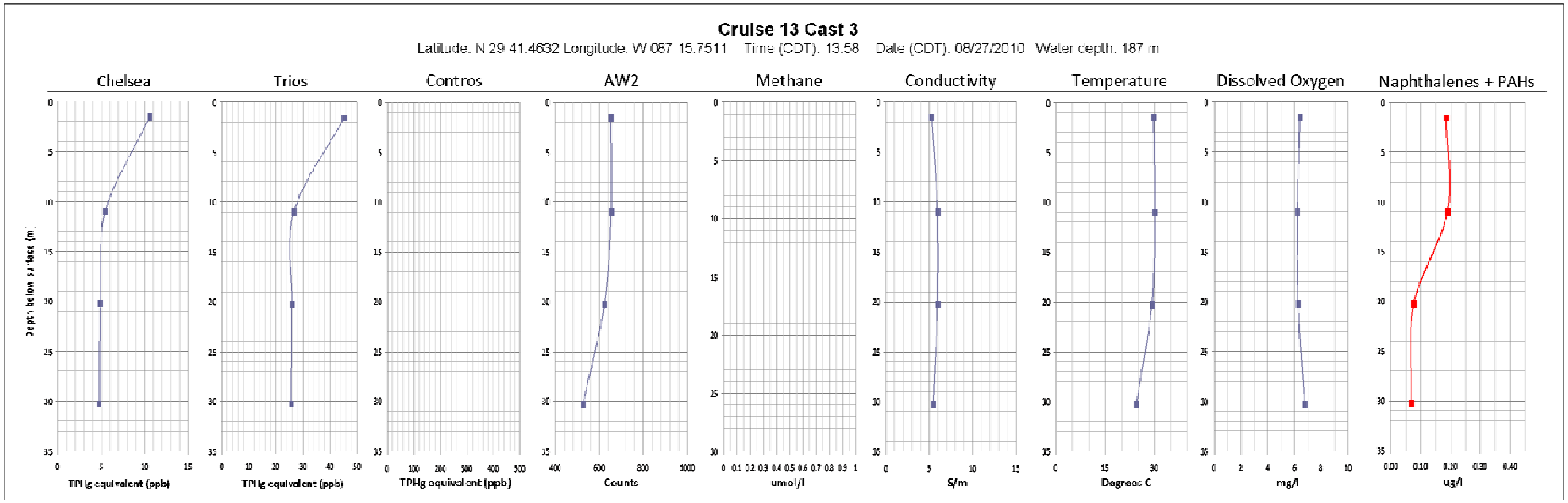

Figure 6. The results obtained for Cruise 13 vertical cast 3 (#3-C13) down to 30 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface.

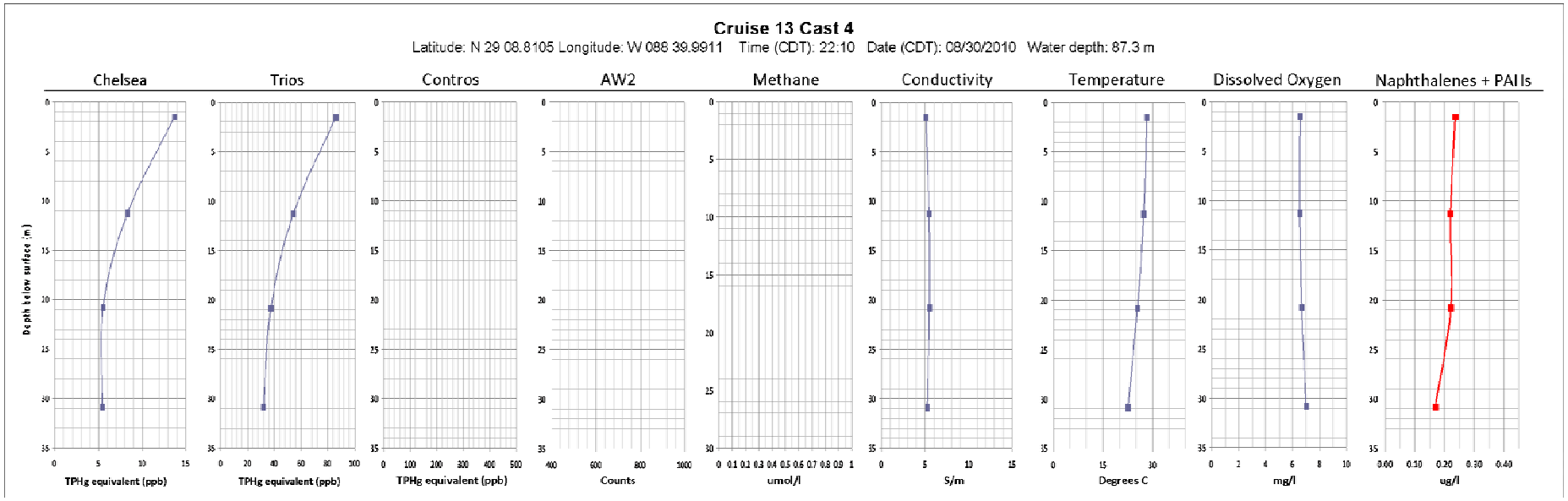

Figure 7. The results obtained for Cruise 13 vertical cast 4 (#4-C13) down to 31 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface.

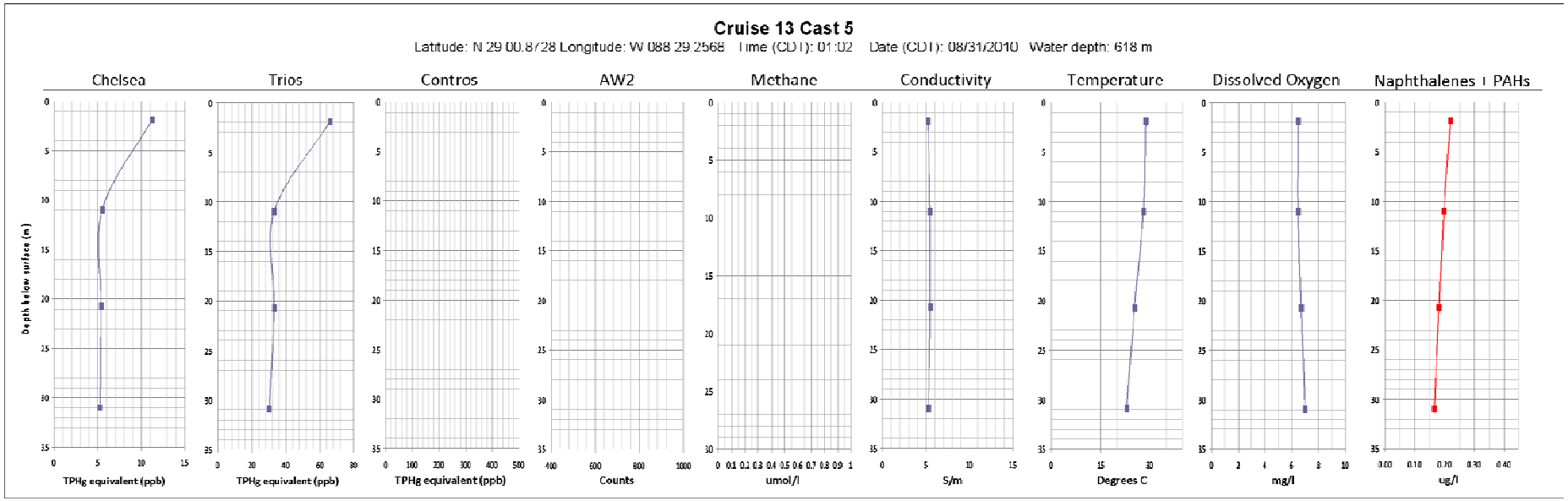

Figure 8. The results obtained for Cruise 13 vertical cast 5 (#5-C13) down to 31 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface.

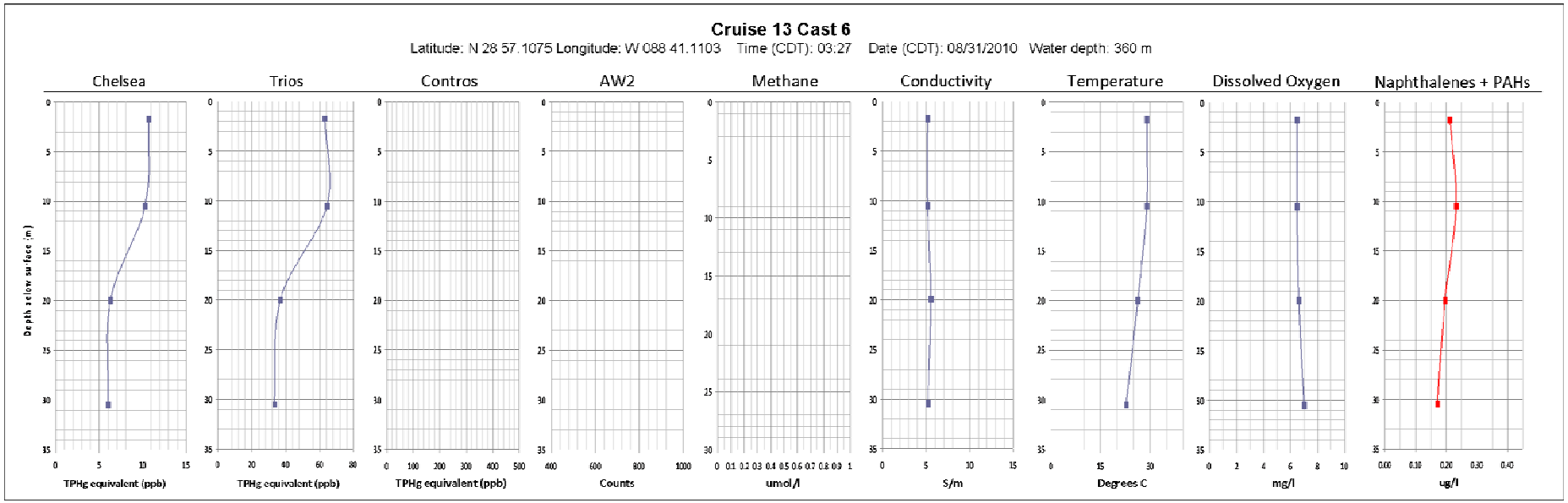

Figure 9. The results obtained for Cruise 13 vertical cast 6 (#6-C13) down to 31 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface.

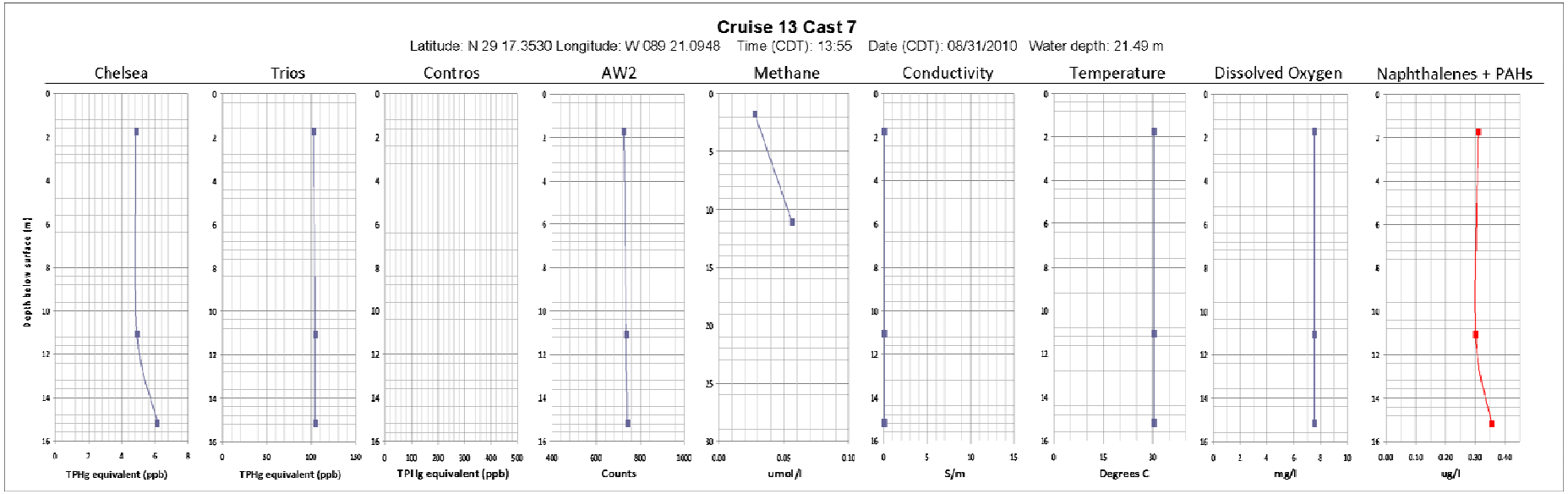

Figure 10. The results obtained for Cruise 13 vertical cast 7 (#7-C13) down to 35 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface.

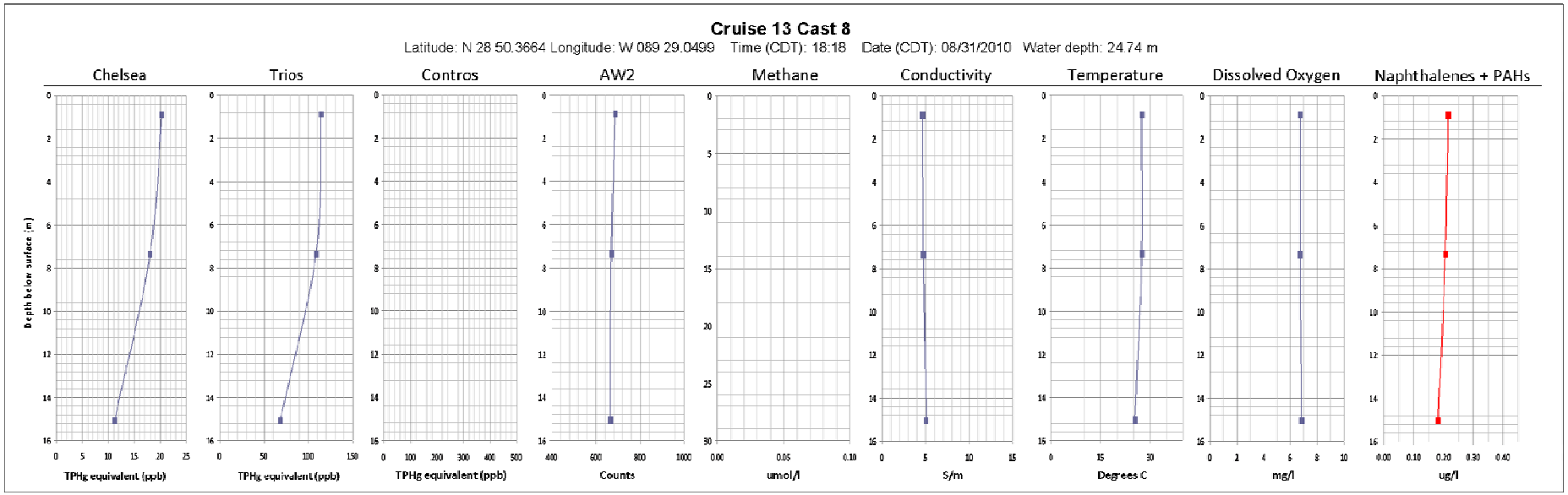

Figure 11. The results obtained for Cruise 13 vertical cast 8 (#8-C13) down to 35 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface.

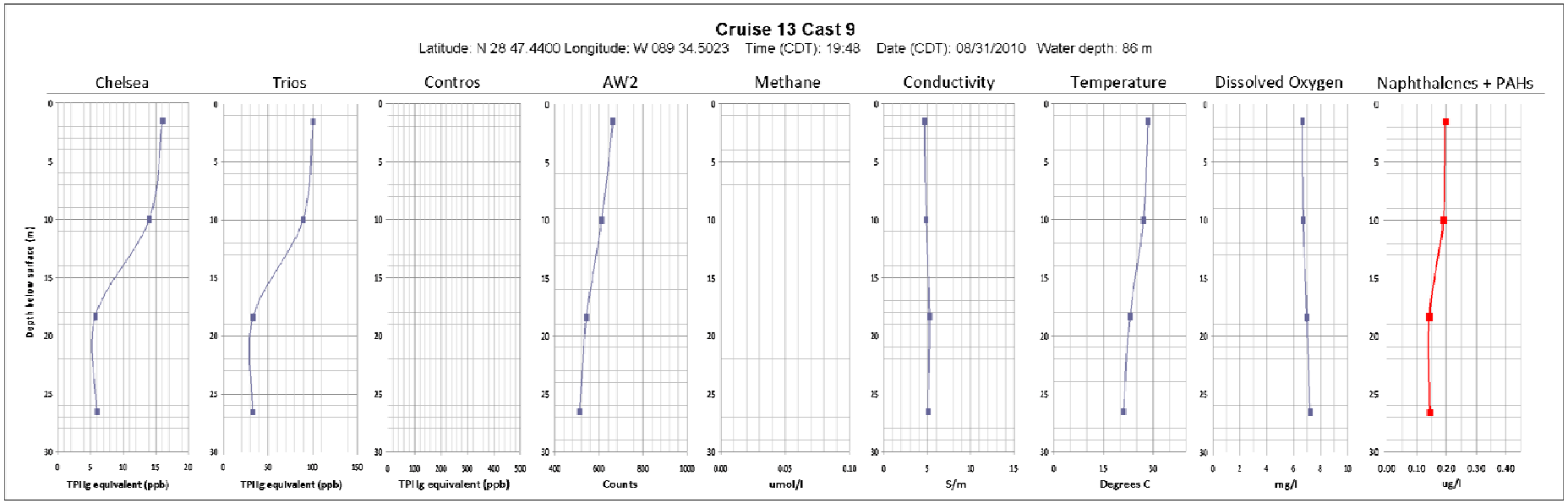

Figure 12. The results obtained for Cruise 13 vertical cast 9 (#9-C13) down to 27 m. The sensor fluorometry results for the Chelsea, Trios and Contros sensors and water samples were obtained from waters pumped to the surface. Conductivity, temperature, depth and dissolved oxygen measurements were obtained from a SBE 19+ system and oxygen sensor attached to the submersible pump used to draw the water into the sensor tank on the surface.

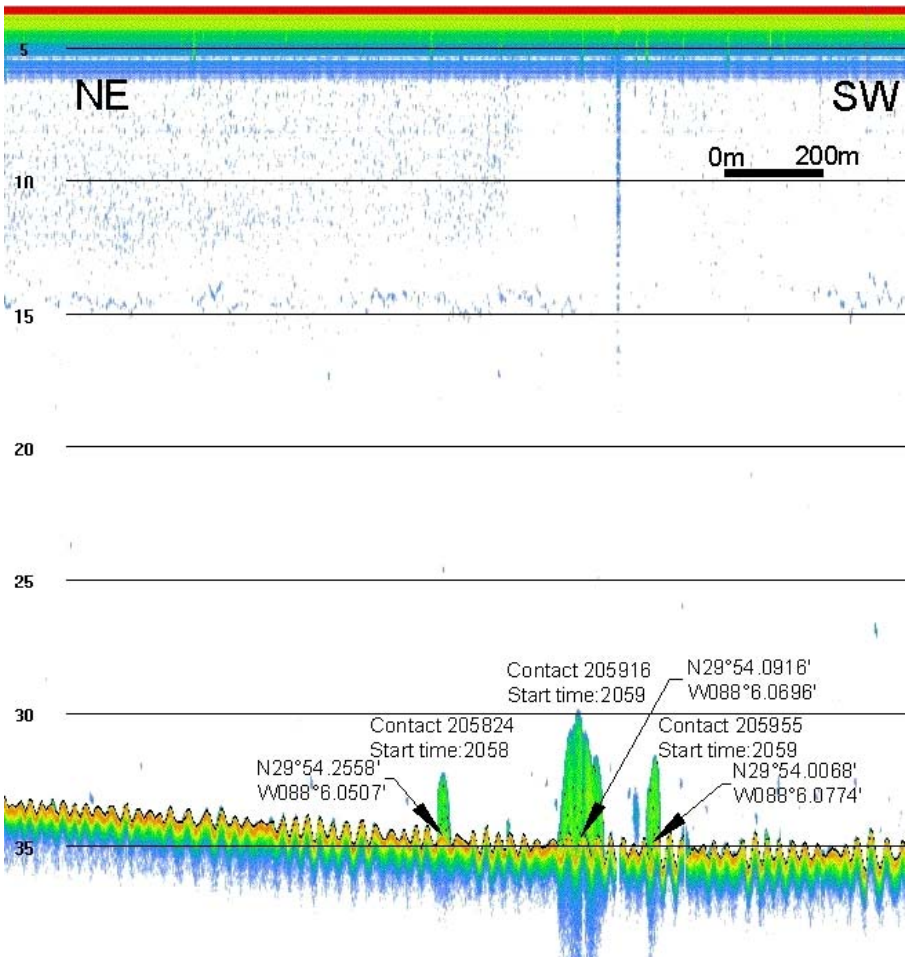

Figure 13. Contacts as marked on figure 1 along track line from Theodore to Southwestern Pass of the Mississippi River. This line is oriented from Northeast on the left to Southwest. a) Contact_08302010_205824. Description: Bottom contact. Time (CST): 08/30/2010 15:58:24. Location: 29° 54.2558N, 88° 06.0507W. Depth: 32.1m to 34.9m. b) Contact_08302010_205916. Description: Bottom contact. Time (CST): 08/30/2010 15:59:16. Location: 29° 54.0916N; 88° 06.0696W. Depth: 29.8m to 35.1m. c) Contact_08302010_205955. Description: Bottom contact. Time (CST): 08/30/2010 15:59:55. Location: 29° 54.0068N, 88° 06.0774W. Depth: 31.5m to 35.0m.

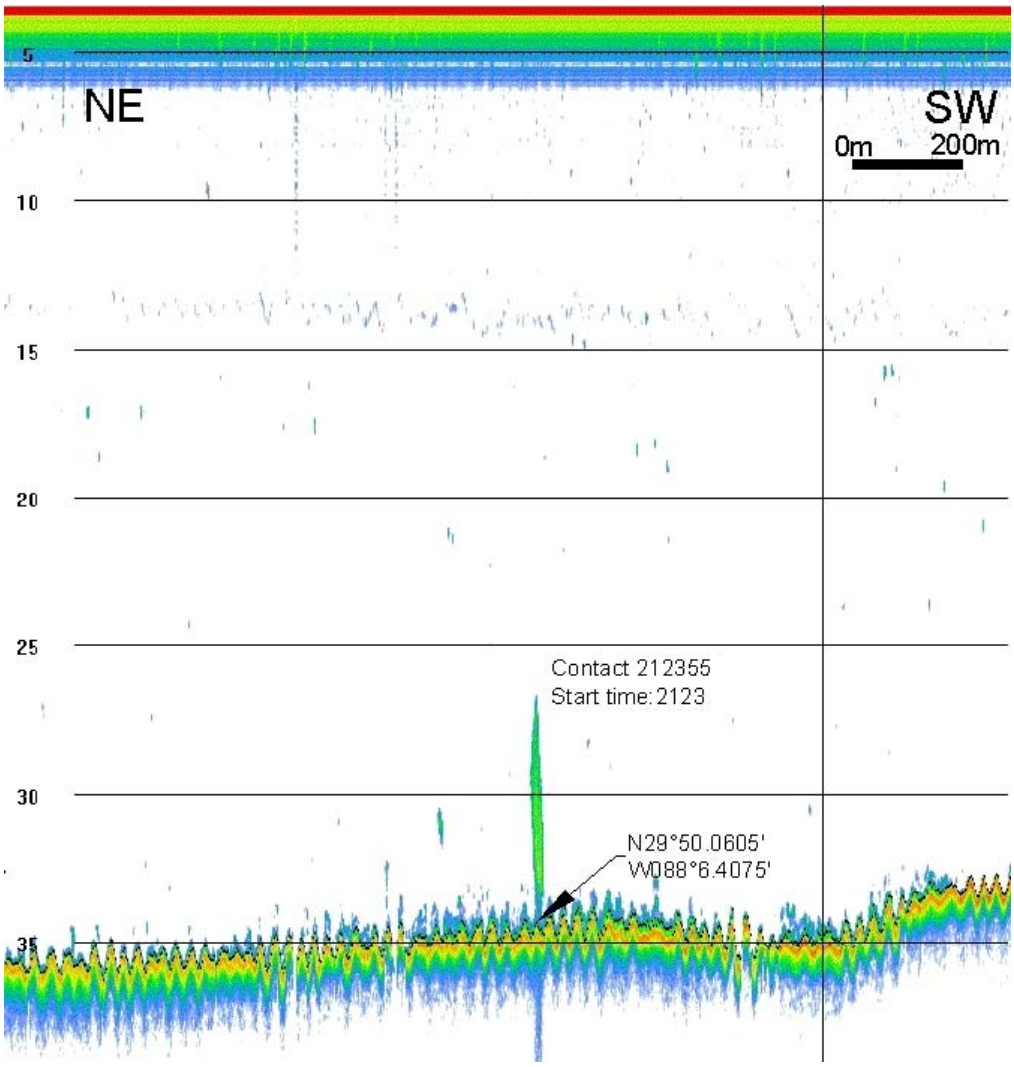

Figure 14. Contact_08302010_212335. Description: Bottom contact with straight trail to midwater. Time (CST): 08/30/2010 16:23:35. Location: 29° 50.0605N, 88° 06.4075W. Depth: 26.9m to 34.9m.

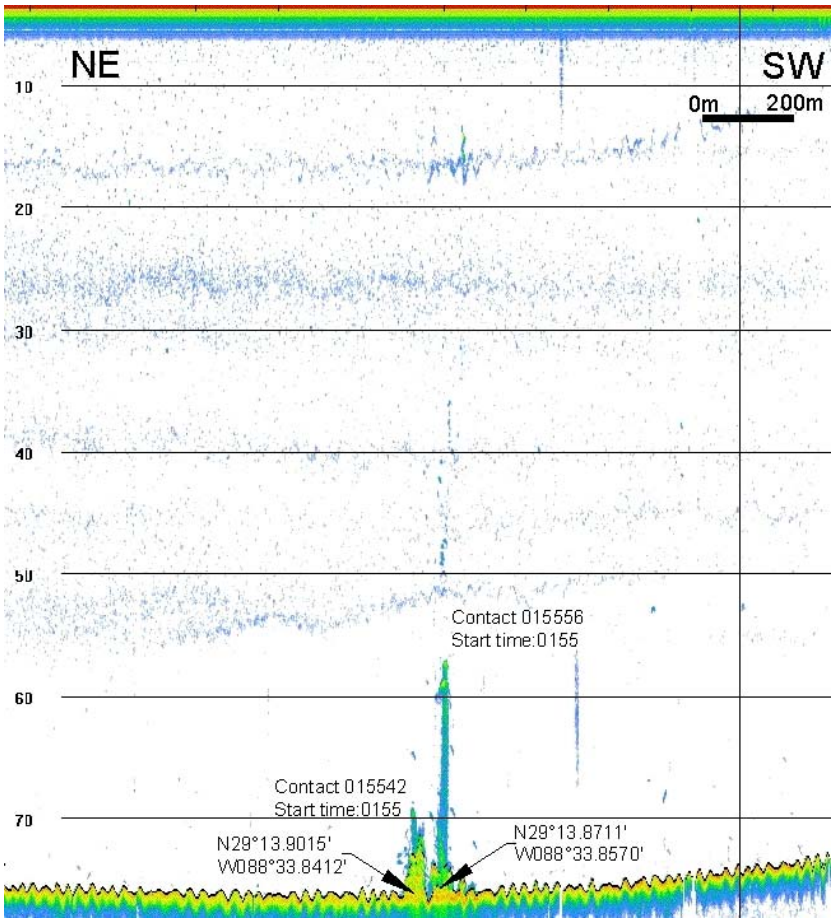

Figure 15. 2 contacts identified. a) Contact_08302010_015542. Description: Bottom contact. Time (CST): 08/30/2010 20:55:42. Location: 29° 13.90115N, 88° 33.8412W. Depth: 68.5m to 76.6m. b) Contact_08302010_015556. Description: Bottom to midwater contact with straight trail to near surface. Time (CST): 08/30/2010 20:55:56. Location: 29° 13.8711N, 88° 33.8570W. Depth: 56.9m to 76.0m.

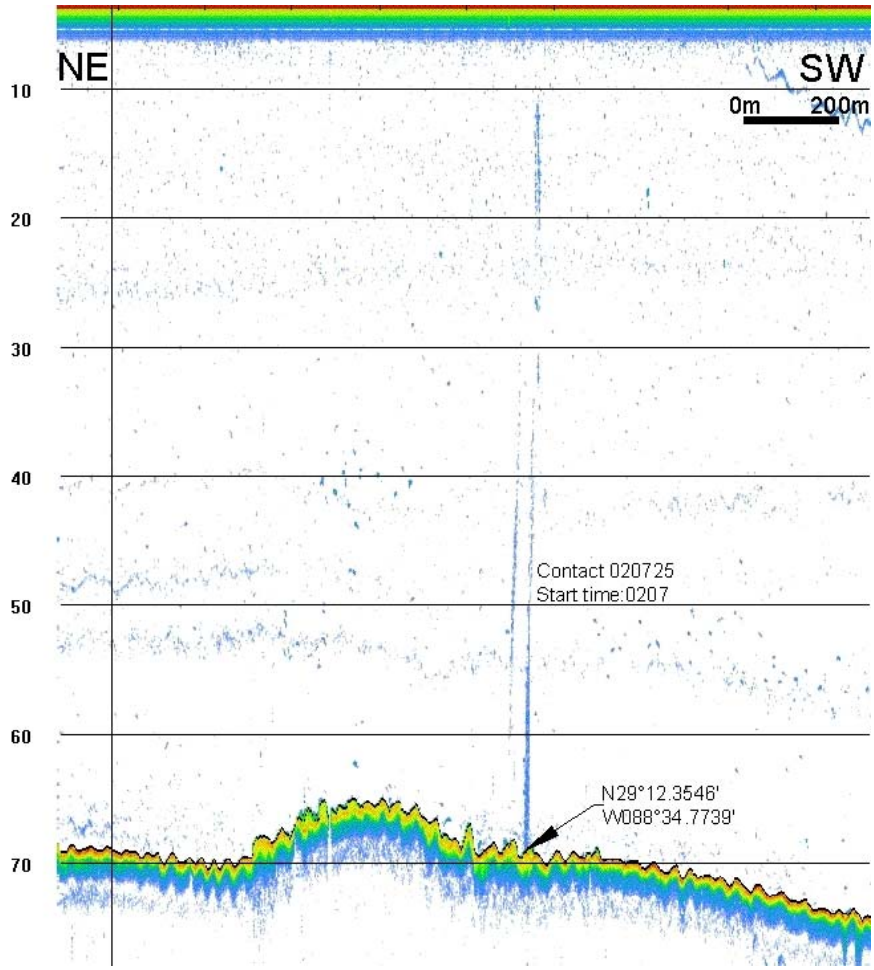

Figure 16. Contact_08302010_020725. Description: Broken trail from bottom to near surface after similar midwater contact. Time (CST): 08/30/2010 21:07:25. Location: 29° 12.3546N, 88° 34.7739W. Depth: 10.2m to 69.1m.

Problems/operational issues:

During cruise 13 there were minimal operational problems.

08/26
Prior to leaving the dock at Theodore we noticed two small pinhole leaks in the copper tubing of the hydraulic system for the crane. The repair was completed and the tubing is set to be replaced in Port Fouchon. We were delayed leaving Theodore due to the repair.

08/27
A crack in the shaft coupling sleeve of the sprocket operating the pulley system of the winch caused the winch to be out of commission. The crane was used to remove the vertical casting pump from the water. The winch required a new sprocket so we decided to cut the cruise short and head back to Theodore for the replacement part sent from the manufacturer, Southern Crane Company. In route, we rendezvoused with the Wave glider and retrieved it. The retrieving process was more difficult than expected, primarily

because it was after daylight hours and rough weather. During retrieval, the solar panel and antenna was damaged.

08/28
The Wave glider continued to travel eastward at an average of 2 knots collecting fluorometry and CTD data. Fluorometer measurements were logged for the majority of the period, excluding the period when the glider is recovered.
During the start of the fourth vertical cast, a crack in the shaft coupling sleeve of the sprocket, operating the pulley system of the winch, caused the winch to be out of commission. We used the crane to remove the vertical casting pump from the water and attempted to fix the sprocket. We decided to cut the cruise short and head back to Theodore for the replacement part sent from the manufacturer, Southern Crane Company. In route, we rendezvoused with the Wave glider and retrieved it. The retrieving process was more difficult than expected, primarily because it was after daylight hours and rough weather. During retrieval, the solar panel and antenna was damaged.

08/30
The vertical cast pump shorted out and was repaired. In addition, repeated wave activity bringing water onto the deck eventually shorted out the A/C unit in Unit 98. The building unit was eventually replaced.

08/31
The underway system was not deployed due to rough seas. The big waves caused damages to several Instrument/facilities; these include the AW40 sensor and the air conditioner in the CSIRO office container, which were down because seawater got into the connectors. The AW40's sensor probe has been replaced to restore the AW40's functionality.

09/01
Due to the rough seas the electrical connection of the underway pump caused periodic electrical shortages. The underway pump was removed from the river at approximately 11:00. The CSIRO office unit (#98) experienced a shortage in the A/C unit that lead to complete failure of the unit and various other electrical components in the unit.

Selected Photographs:

Photo 1: Moving the Wave glider off the Ryan Chouest and slowly lowering it into the Gulf.

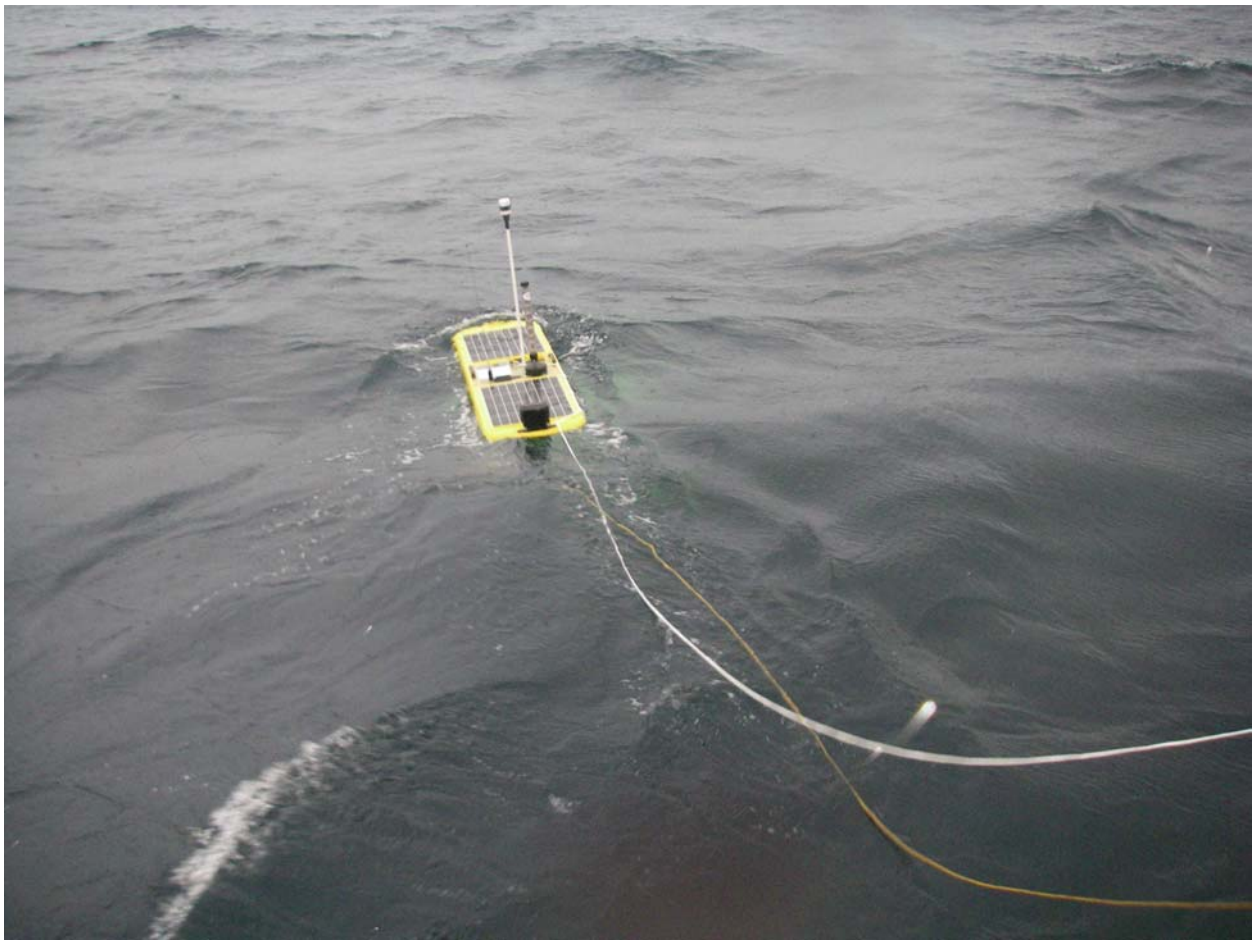

Photo 2: Wave glider successfully deployed.

Photo 3. Photo taken ~5nm away from the mouth of the Mississippi river showing relatively sharp boundary between the green and brown water.

Planned activities for next 24 hours and next cruise:

The Ryan Chouest docked in Port Fouchon for scheduled modifications involved in the addition of the CTD. We will be setting out to sea on 09/04 for cruise 14. There are two main objectives planned for Cruise 14. The first objective is to deploy the CTD and become familiar with the instrument and make sure it is operational. The second objective is revisit several previously identified methane hydrate seeps and lower the CTD into them. This will further characterize the seeps and their impact on the PAH concentrations in the water. Wednesday, 09/08/2010, we will arrive in Theodore for a crew change and pick up two wave gliders.

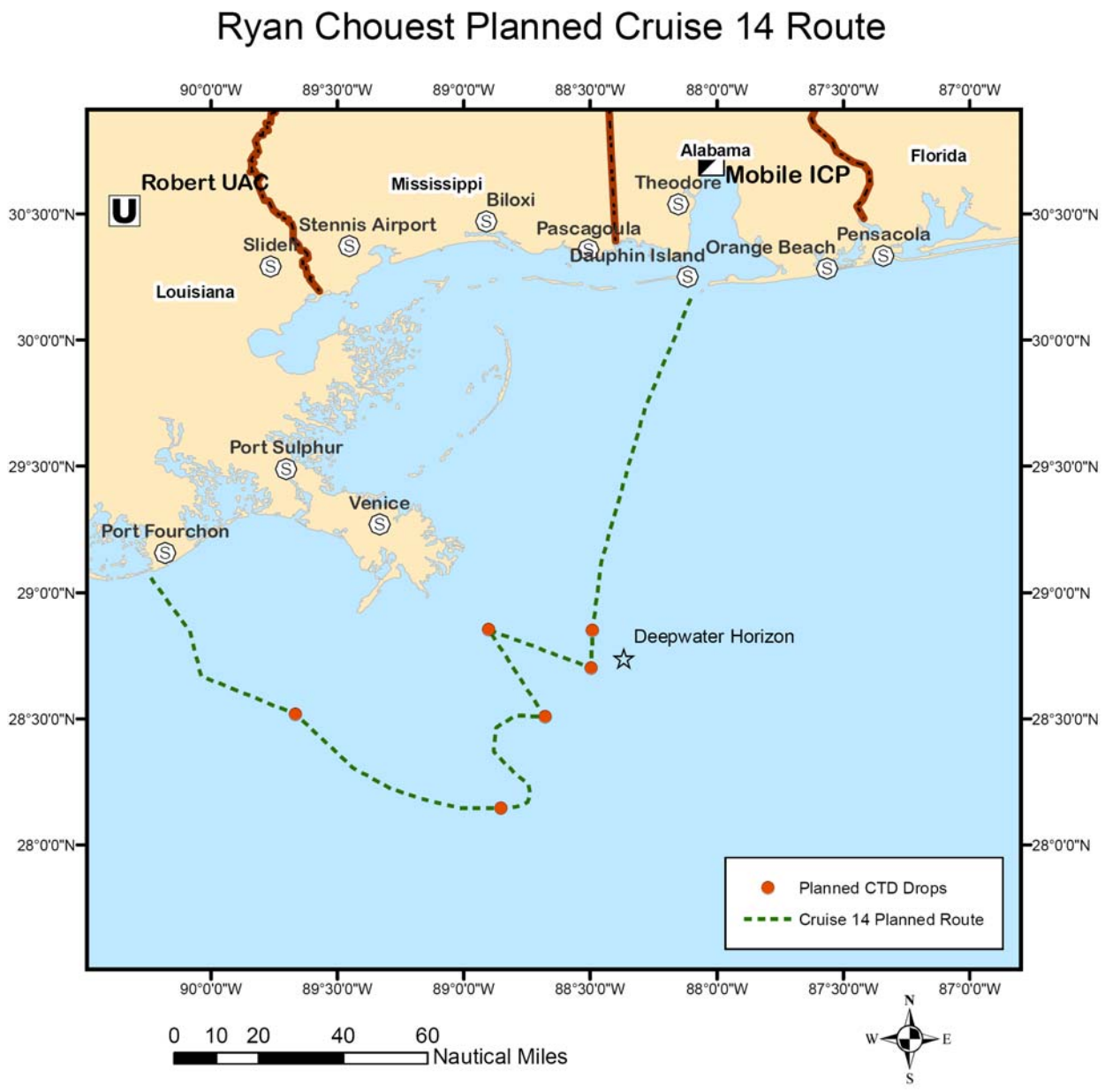

Figure 17. Planned route for cruise 14 between 09/04/2010 – 09/08/2010 of the Ryan Chouest.

Full Crew List:

William A. Smith	MASTER	Brian Corley	Mate
Robert Thompson	ENG	Kevin Hartley	Qmed
Mark Harmon	A/B	Ricky Matherne	A/B
Trever Dorics	A/B	Patrick Anderson	A/B
Jason Bednarski	A/B/Cook	Steven Morgon	OS/Cook
Rebecca Tedford	BP	Curt Walker	Entrix
Xiubin Qi	CSIRO	Stephane Armand	CSIRO
Andy Revill	CSIRO	Charlotte Stalvies	CSIRO
Tim MacEwan	C&C	Bobby Patrick	C&C
Brett Bundick	C&C	Josh Chauffe	C-Port
Mathew Bahan	C&C	Larry Luke	C-Port

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