

CRUISE REPORT

DEEP HORIZON CRUISE – RAPID GULF SURVEY: WALTON SMITH WS1010A CRUISE

Prepared by: Michelle Wood, NOAA/OAR/AOML

RSMAS CRUISE # - WS1010A

SHIP NAME: R/V WALTON SMITH

CRUISE DATES: June 6 -10, 2010

CHIEF SCIENTIST: Michelle Wood

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PORT OF EMBARKATION: Gulfport, MS

PORT OF DISEMBARKATION: Miami, FL

CRUISE SUMMARY: This cruise took advantage of available berths, and some flexibility in the return transit time, for the R/V Walton Smith to “deadhead” from Gulfport, MS to Miami, FL after an NSF-funded study of conditions and microbial activity in the vicinity of the Deep Horizon well site that ended on June 6. Ship-time was provided at no cost to NOAA by the University of Miami. The cruise occurred at a time when the academic community (and some scientists at AOML) were claiming that not enough attention was being paid to the possibility of oil being transported away from the Northern Gulf of Mexico and towards South Florida by the Loop Current (LC). Additionally, NOAA Office of Response and Restoration (OR&R) had interest in obtaining observational data from the “Tiger Tail”, a long filament extending to the SE from the spill site; the “Tiger Tail” had been identified by satellite observation, aircraft observation, and model results as a potential mechanism for transport of oil to the far field. Several satellite products and model results being circulated by academic and commercial sources were suggesting even greater penetration of oil into the Loop Current and Florida Current than OR&R (Fig. 1). Thus, there was considerable demand for some observational research in the far field, away from the well site, and in regions where connectivity between the spill area and Florida Current might exist. The condition of the LC and associated features as interpreted by AOML at the time of the cruise is shown in Fig. 2.

The specific goals of the cruise were:

- 1) To survey regions of likely accumulation of oil in the LC and associated features insofar as possible, given the available ship time, 2) collect samples of petroleum sheen, tar balls, or oil-in water - if encountered - for fingerprinting by the Response and Chemical Assessment Team at Louisiana State University,

3) observe condition and abundance of birds and other vertebrates along the cruise track, 4) collect neuston tows for tar balls and assessment of the identity and condition of larval fish and invertebrates in the water, 5) collect information about water column properties using ship-board underway system and deck-mounted CTD, 6) support modeling efforts for the response by deploying XBTs every hour and serving the data in near-real-time to the AOML ftp site and GTS, and 7) deploy 14 Argos drifters in the LC and associated eddies along the cruise track to provide information about direction and potential rate of transport of floating material in surface waters.

The cruise track and sampling plan were closely coordinated with the Joint Incident Command and specific sites identified by OR&R were sampled whenever possible. The cruise track was also informed by information supplied by Roffer's Oceanographic Fish Finding Service and data obtained from the XBTs and hull-mounted ADCPs to maximize encounter with convergent flow that would concentrate floating material (e.g. weathered oil and tar balls). On June 8, C-130 aircraft support was provided by the USCG, observers on the aircraft identified a suspicious region of "glossy" water located between 26° 48.4'N, 86° 05.1'W and 26° 42.3'N, 85° 58.1'W. The feature was about 0.25 miles wide and 6.0 miles long; upon arrival in the area at approximately 1300 local time, orange flocculent material was observed in the water similar to that observed close to the well-head, and floating "tar balls" or soft pads of aggregated material were observed in the water. These ranged in size from ~6-inch or dinner-plate size in diameter and many smaller. Abundance was difficult to assess from the bridge watch but five or six "tar balls" would pass the ship within 25' every few minutes. A 30 minute neuston tow recovered one large tar ball and one small one; the large one was collected by scraping a Teflon sheen net on the neuston net; a total of three sheen nets were required to collect all of the material from the single tar ball. Analysis by the RCAT (Response and Chemical Assessment Team) at Louisiana State University confirmed that this sample was a match to MC252 oil (Figs. 3 and 4). Of the nine water samples and 14 sheen samples collected along the cruise track, this sample and one water sample collected close to the well head (28° 52.5'N, 88° 0.53'W) were the only samples that contained a noteworthy amount of hydrocarbons; both of these samples matched MC 252 oil based on GC/MS analysis (Figs. 3 & 4). Drifters deployed in the tar ball feature traveled into Eddy Franklin and had not entered the Florida Current as of July 1 (Fig. 6). Model results provided by AOML/PhOD based on release of simulated tar balls with the properties of water molecules (e.g. neutrally buoyant and infinite lifespan) at the site where we collected our samples also indicate that the most probable fate for the actual tar balls would be entrainment into Eddy Franklin (George Halliwell, AOML, pers. comm.).

Observations for birds and other vertebrates were conducted during daylight hours by a trained observer, assisted by the ship's crew. Most noteworthy was the low number of species and individuals encountered. No turtles were observed on the cruise, bottle-nosed dolphins were encountered once, and spotted dolphins twice; none showed signs of oil contamination. Birds observed included adult Brown Boobies, Sooty Terns, Sooty Shearwaters and Laughing Gulls; repeated observations

of Band-Rumped Storm Petrels were especially noteworthy as sightings of these rare birds are unusual. Band-Rumped Storm Petrels were found exclusively at or near the convergence between Eddy Franklin and a large cyclonic frontal eddy NE of Eddy Franklin; other bird observations were too sparse to link to any surface features. Birds in flight were checked for oil contamination and none were found.

Neuston tows were conducted at four locations and a high abundance of larval organisms observed twice. Approximately 1000 crab megalopa were recovered after a 30 minute neuston tow at 27° 45.39' N and 86°47.97'W and a high abundance of larval fish were recovered after a 30 minute neuston tow off the Florida Keys. Included were several hundred larval file fish (Monocanthidae) and several hundred larval puffer fish (Tetradontidae). None of the larvae showed visible signs of oil contamination. [Fish larvae identification provided by Dr. R. Cowen(CIMAS/RSMAS)].

45 XBTs were deployed on the cruise (Fig. 7) with all XBT data posted to the GTS and AOML ftp site during the cruise; 14 drifters were deployed, 2 at each of 7 locations (Fig. 6). Four net tows and three CTD stations were completed; nutrient samples and chlorophyll samples were collected at multiple depths on each CTD cast.

XBT data are described at

http://www.nodc.noaa.gov/General/deepwater_oceanprofile.html#walton and

temperature sections can be obtained at :

http://www.aoml.noaa.gov/phod/dhos/xbt_ctd.php

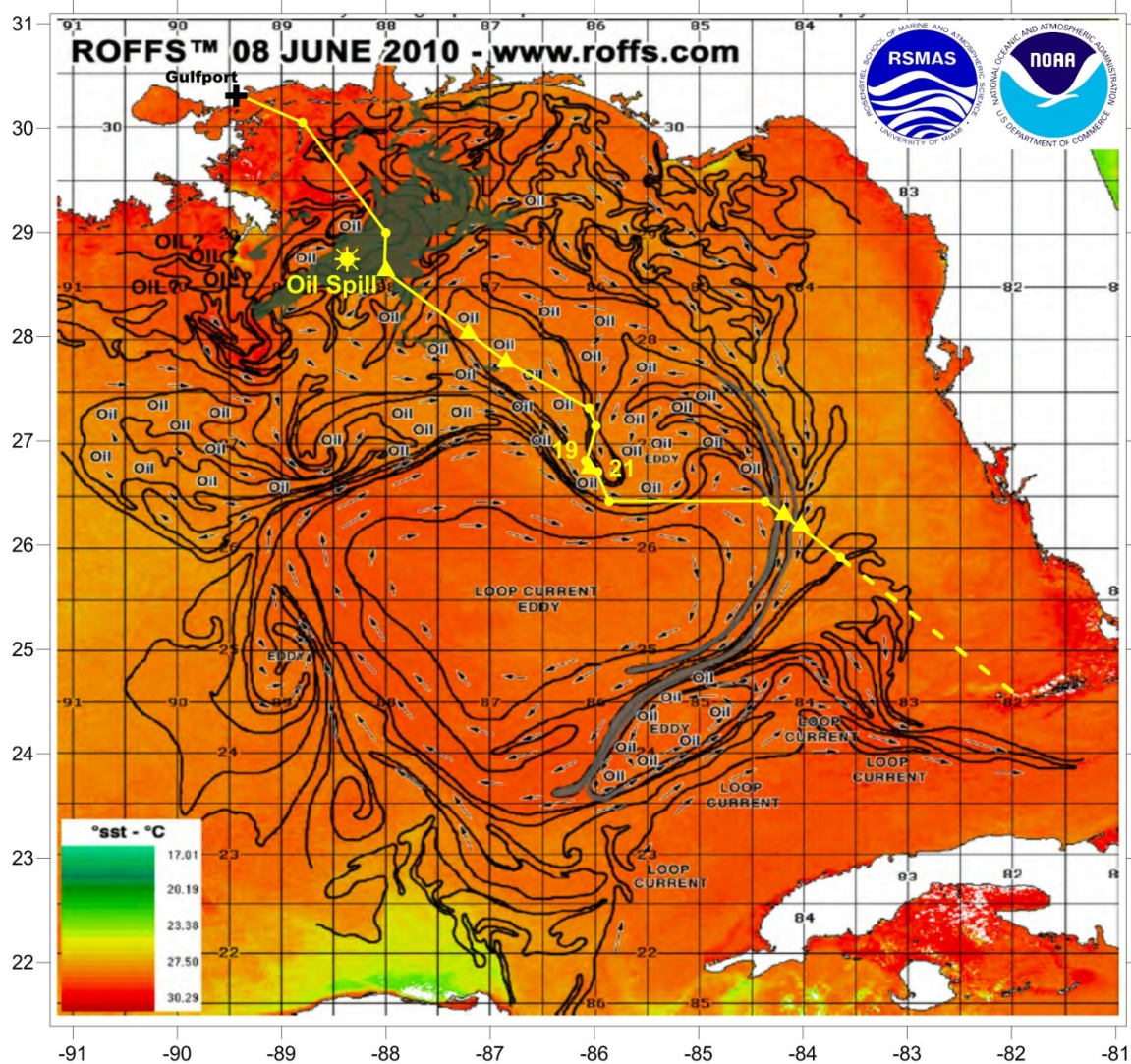
EMBARKED SCIENTIFIC PERSONNEL:

Dr. Michelle Wood	NOAA/OAR/AOML	Chief Scientist
Dr. Tom Lee	CIMAS /RSMAS	Physical Oceanography Lead
Nelson Melo	NOAA/OAR/AOML CIMAS	Physical Oceanographer
Charles Featherstone	NOAA/OAR/AOML	Chemical Oceanographer
Dr. David Lee	The Tortoise Reserve North Carolina St. Museum	Ornithologist

OTHER SUPPORT:

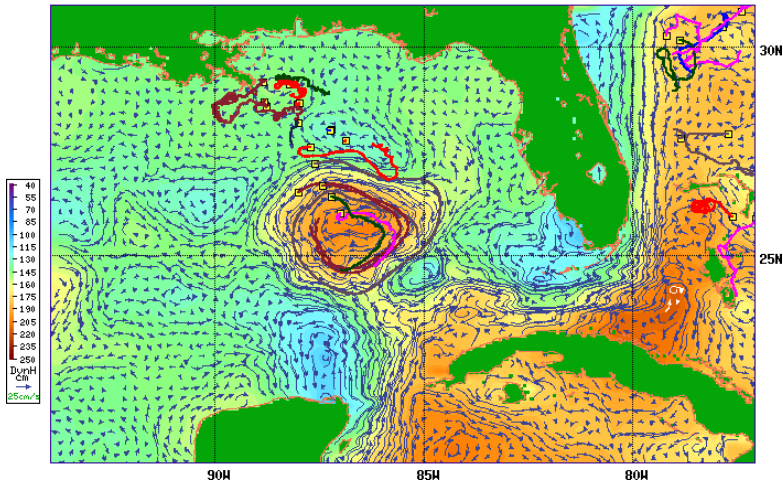
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Dr. Chris Kelble	NOAA/OAR/AOML
Dr. Scott Miles	Louisiana State University
Dr. Chris Haney	Defenders of Wildlife
Dr. Peter Ortner	CIMAS/RSMAS
Dr. Mitchell Roffer	Roffers Ocean Fish Forecasting Service

R/V Walton Smith WS1011 cruise track (June 06 - 09 2010)
 superimposed on ROFFS oil spill analysis (June 08 2010)



Cruise track given with yellow line.
 Turning points given with yellow dots.
 Station with drifters releases given with solid yellow triangles.
 Oil plume surveyed between stations 19 and 21.
 XBT stations made every 10 nautical miles between BP oil spill site (yellow star) and the east end of the survey.

Figure 1. ROFF's oil projection for June 8, with major features of circulation identified by a combination of SAR imagery and other remote sensing products. Cruise track shown in yellow with position of drifter deployments shown in yellow triangles. The tar ball sample described in the fingerprint analysis shown in Figs. 3 and 4 was collected between stations 19 and 21.



Offshore
Surface Oil Forecast
Deepwater Horizon MC252

NOAA/NOS/OR&R **Offshore**
Estimate for: 1200 CDT, Tuesday, 6/08/10
Date Prepared: 1900 CDT, Monday, 6/07/10

Currents were obtained from five models: NOAA Gulf of Mexico, NavO/NCOM, NRL/IASNFS, West Florida Shelf/USF, and NC St./SABGOM. Each includes Loop Current dynamics. Gulf wide winds were obtained from the gridded NCEP product. The model was initialized from June 6/7 satellite imagery analysis (NOAA/NESDIS) and overflight observations from today. The leading edge may contain tarballs that are not readily observable from the imagery (hence not included in the model initialization).

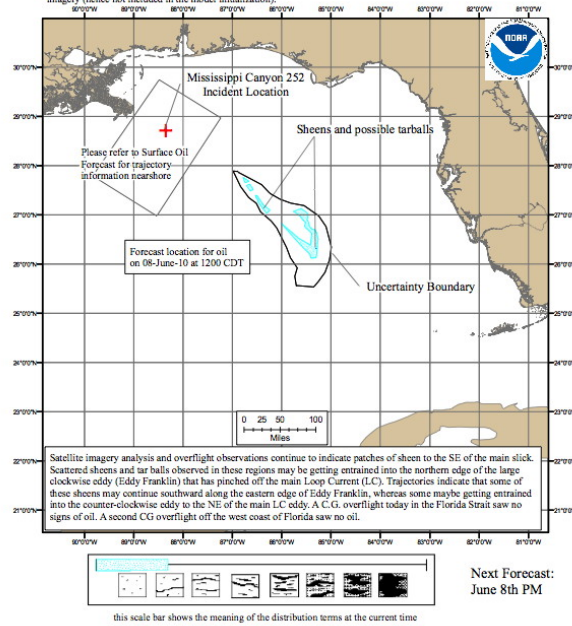


Figure 2. (Top) AOML altimetry derived circulation for the Gulf of Mexico on June 8, 2010. Eddy Franklin is the large anticyclonic eddy located at about 25°N, 86°W; convergence along its boundary with the cyclonic eddy to the NE provides a mechanism for concentrating weathered oil, *Sargassum*, and ichthyoplankton. Band-Rumped storm petrels were observed exclusively in this frontal area. (Bottom) OR&R Offshore Surface Oil Forecast for June 8. The tar ball field sampled on June 8 was located SE of the sheens and possible tar balls projected in blue near 27°N and 86°W, but within the uncertainty boundary of the model prediction.

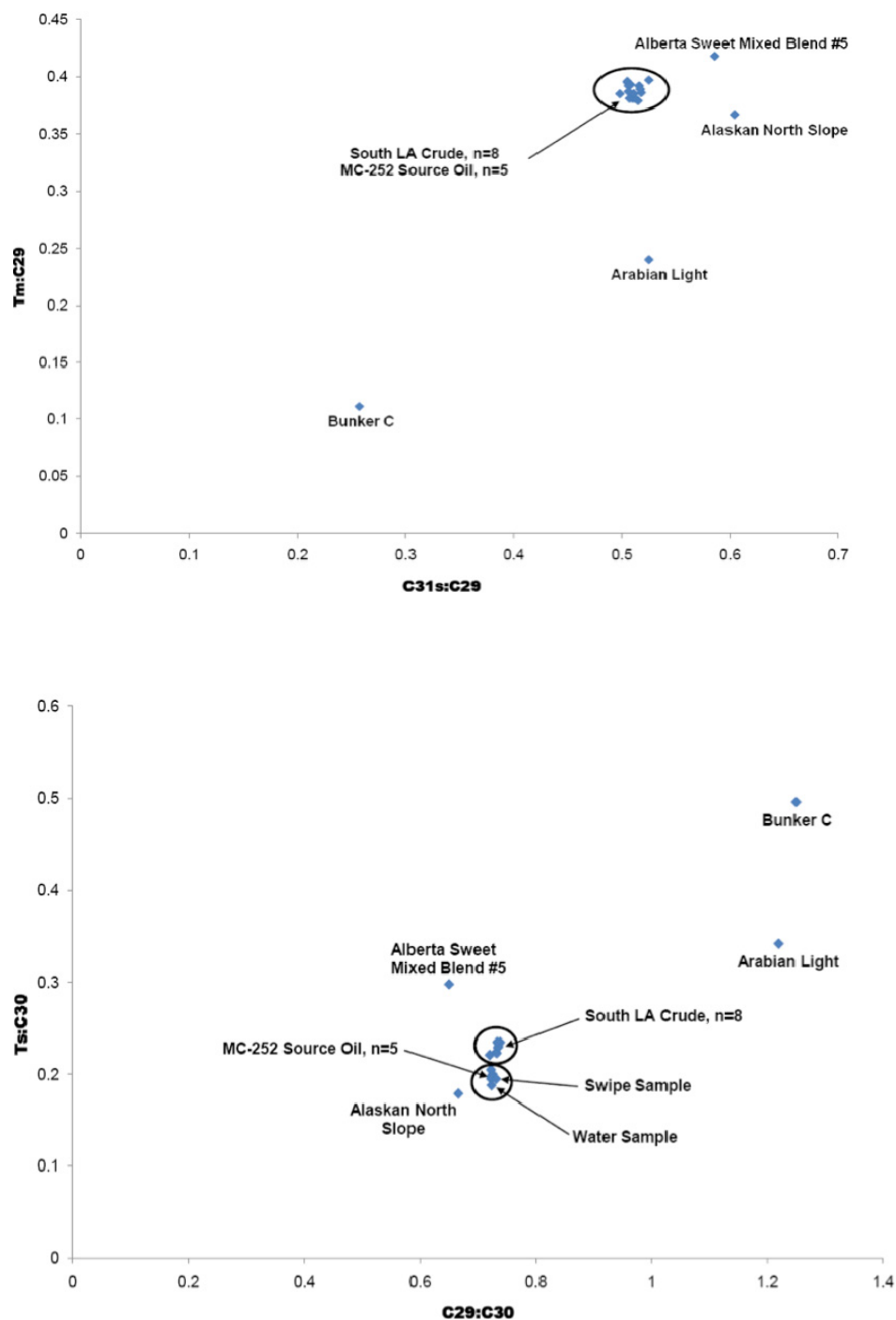


Figure 3. A: Cross-plot of the double ratios of Peak C31s/C29 versus Tm/C29 for crude oils and refined fuel oil. The circle indicates related samples from the same origin. **B:** Cross-plot of the double ratios of Peak C29/C30 versus Tm/C30 for crude oils and refined fuel oil. Each weathered oil series produced a tight cluster. The “swipe” sample is the tar ball sample collected on the Walton Smith at 26° 45.85'N and 86° 03.65'W on June 8, 2010. The “water” sample is a surface sample collected on June 7, 2010, relatively close to the well site at 28° 52.50'N and 88° 0.53'W. Results from GC/MS fingerprinting provided by M. Scott Miles, Louisiana State University.

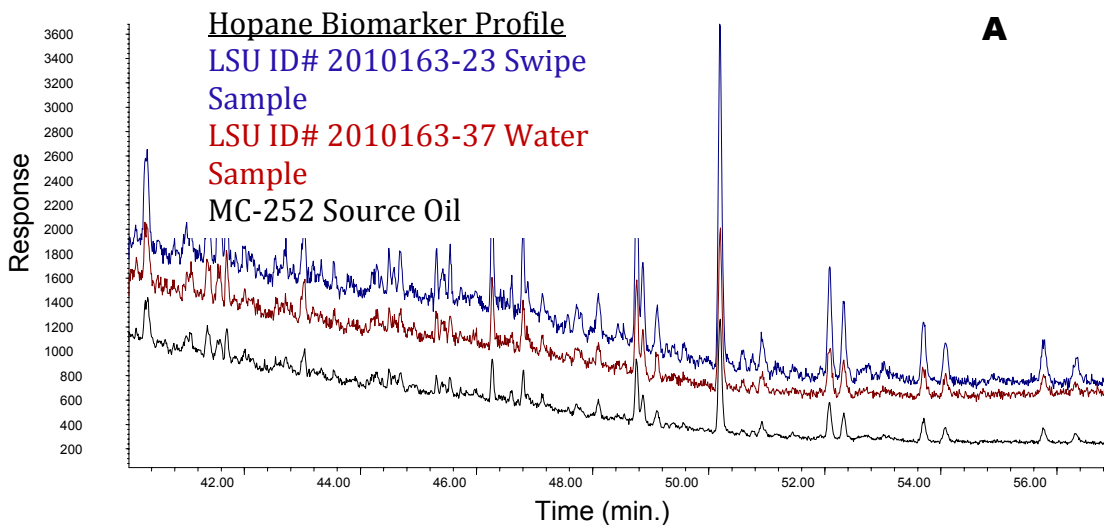
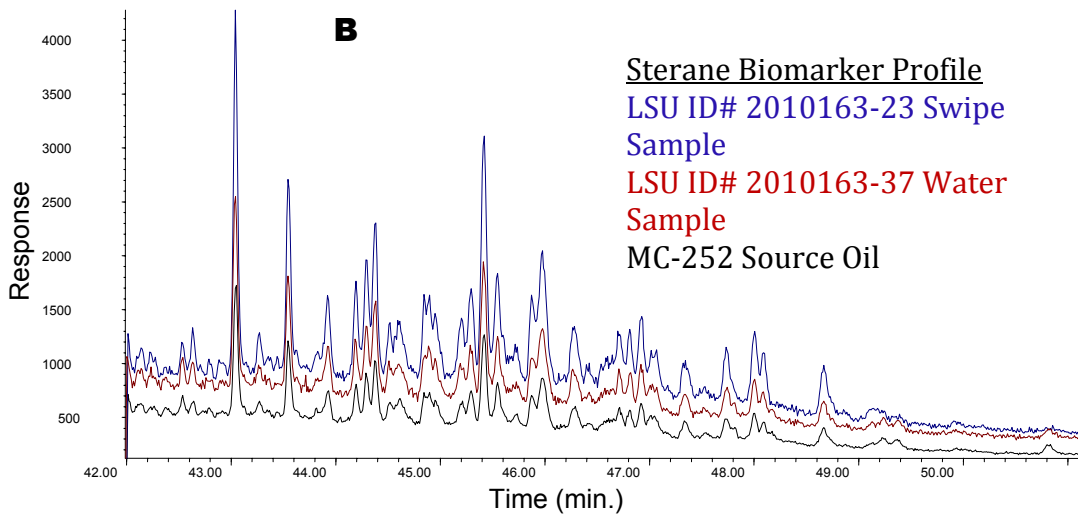


Figure 4. A: Overlay of m/z 191 chromatograms from MC-252 source oil and Walton Smith cruise samples. **B:** Overlay of m/z 217 chromatograms from MC-252 source oil and Walton Smith cruise samples. The overlays of biomarker chromatograms represent a “positive” match between the MC-252 source oil and the two Walton Smith cruise samples. “Swipe” and “Water” samples are as described in Figure 3. Data provided by M. Scott Miles, Louisiana State University.

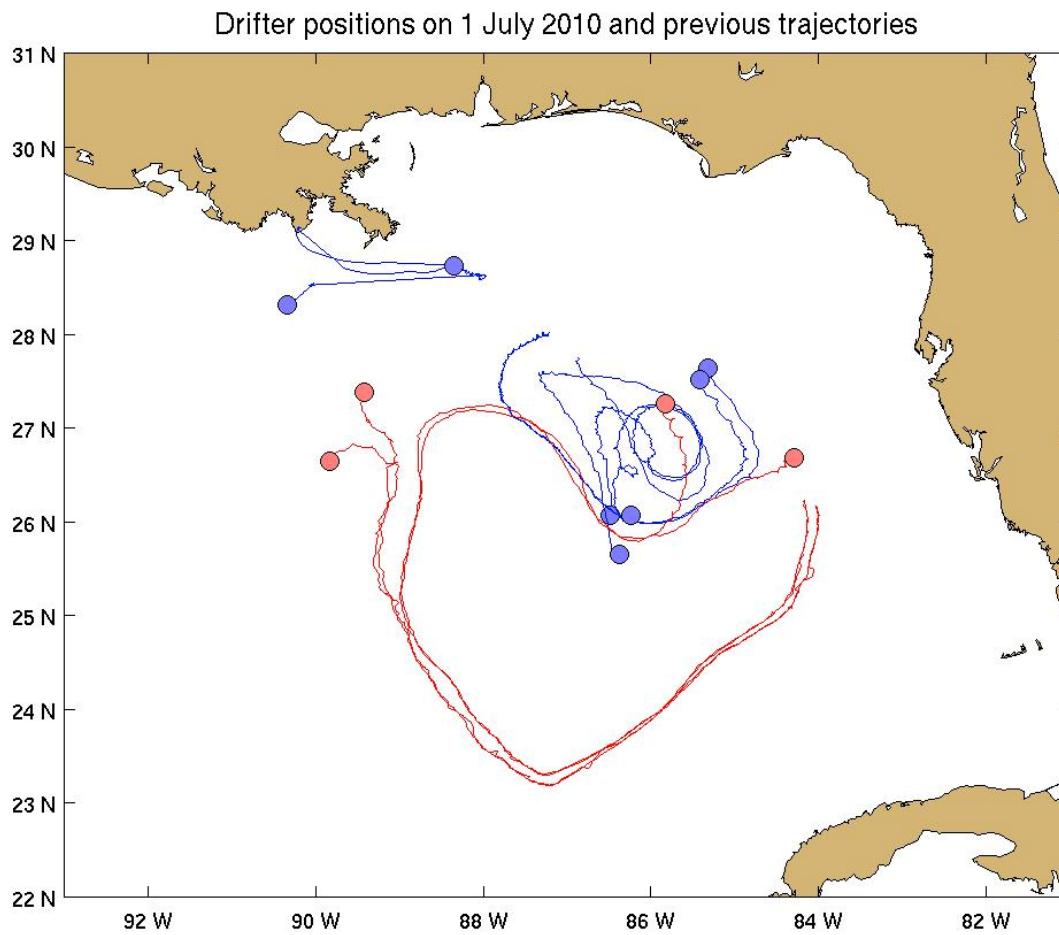


Figure 5. Position tracks for Argos drifters released during WS1011 cruise; location on July 1 shown with circles. One drifter released in the northern portion of the study area was picked up by a vessel and taken to shore, then re-released. Track and position shown in red describe the behavior of drifters released in region of suspected oil and where tar balls were collected.

F.G. Walton Smith XBT Deployments in the GOM (June 7–10, 2010)

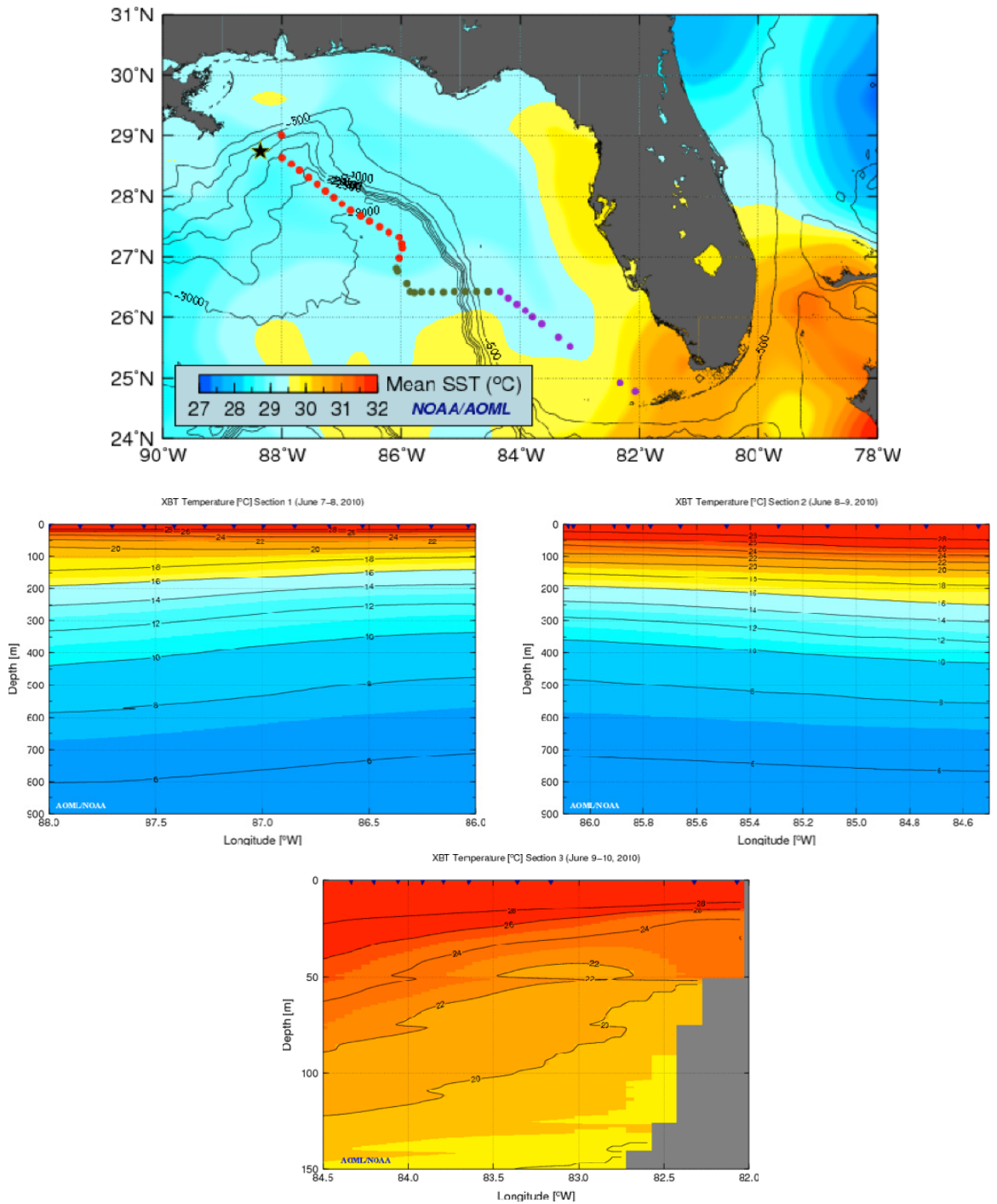


Figure 6. Top, position of XBT deployments from WS1010A cruise; Sections 1, 2, and 3 were contoured from data collected from positions marked with red, green, and purple circles, respectively. The color scale is the same for all panels.