Science Summary Related to the DWH-MC-252 OIL SPILL

NOAA

June 3, 2010

Dr. Jane Lubchenco, Administrator

Immediate Science Actions (First 2 months)

- Scientific support to the IC through the USCG FSOC
- Collection of a broad suite of samples to assess baseline environmental conditions
- Assess the Safety of Seafood and inform appropriate closures of federal waters
- Evaluate dispersant and oil related to seafood safety – conduct baseline contaminant studies
- Assist to calculate oil flow from the DWH site to estimate total release of oil
- Track surface oil and dispersant fate and transport
- Initial studies on effects of dispersants on marine organisms seafood uptake
- Initiate and participate in interagency Joint Analysis Group (JAG)
- Measure impact of subsea dispersed oil on hypoxia events
- Measure distribution and magnitude of subsurface dispersed oil and dispersant through acoustics, fluorescence studies, water sampling and other technologies using NOAA Research Vessels and partners, including IOOS
- Conduct aerial surveys of protected species distribution and abundance
- Update increased sensitivity of the Loop Current hydrodynamics – P-3s dropping AXBTs, sponsoring oceanographic cruises
- Conduct baseline studies of natural resources (water, sediment, biota, human use)
- Develop/Conduct studies to measure injuries of trust resources (water, sediment, biota, human use) by oil and or response actions
- Daily-weekly weather forecasts critical for field operations

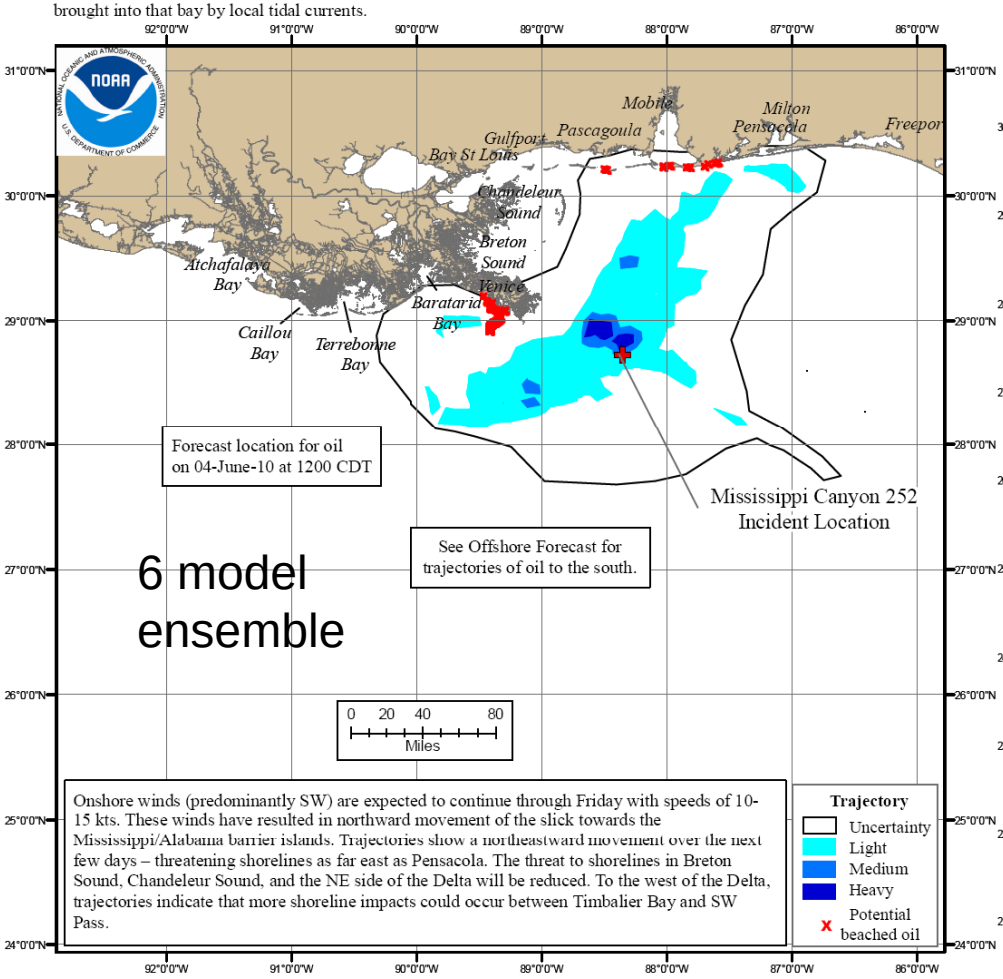
Daily Surface Oil Forecasts

Nearshore Surface Oil Forecast Deepwater Horizon MC252

NOAA/NOS/OR&R **Nearshore**

Estimate for: 1200 CDT, Friday, 6/04/10
Date Prepared: 2100 CDT, Tuesday, 6/01/10

This forecast is based on the NWS spot forecast from Tuesday, June 1 PM. Currents were obtained from several models (NOAA Gulf of Mexico, West Florida Shelf/USF, NAVO/NRL) and HFR measurements. The model was initialized from Tuesday satellite imagery analysis (NOAA/NESDIS) and overflight observations. The leading edge may contain tarballs that are not readily observable from the imagery (hence not included in the model initialization). Oil near bay inlets could be brought into that bay by local tidal currents.



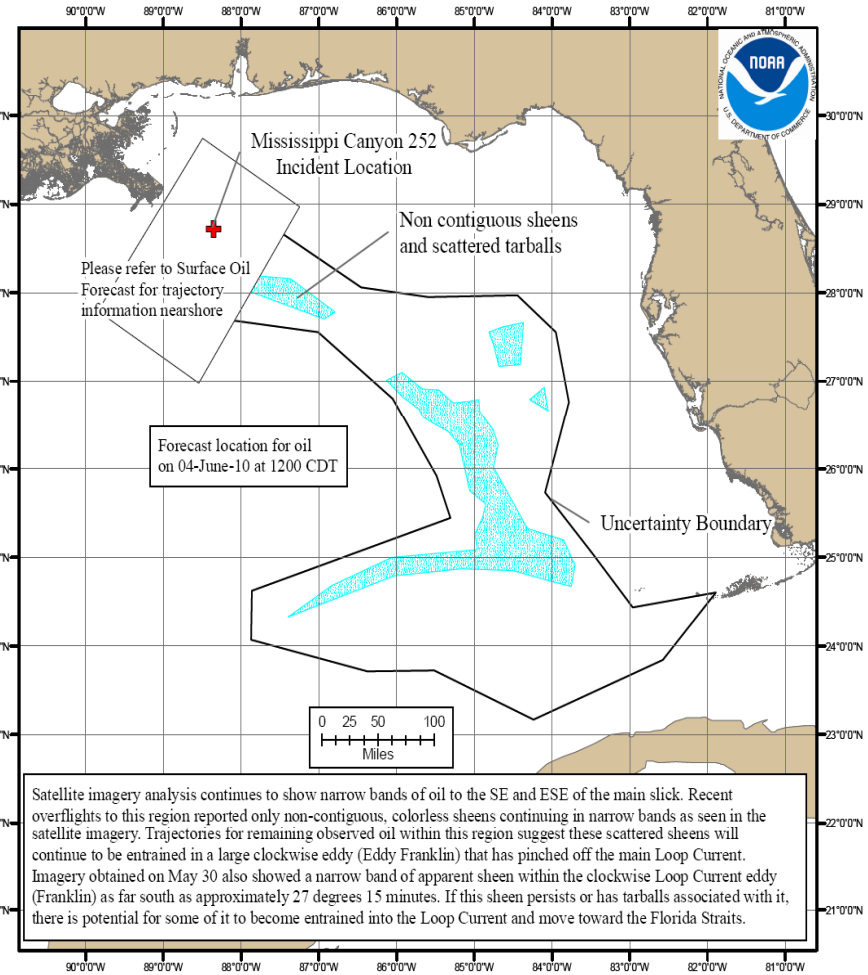
Onshore winds (predominantly SW) are expected to continue through Friday with speeds of 10-15 kts. These winds have resulted in northward movement of the slick towards the Mississippi/Alabama barrier islands. Trajectories show a northeastward movement over the next few days – threatening shorelines as far east as Pensacola. The threat to shorelines in Breton Sound, Chandeleur Sound, and the NE side of the Delta will be reduced. To the west of the Delta, trajectories indicate that more shoreline impacts could occur between Timbalier Bay and SW Pass.

Offshore Surface Oil Forecast Deepwater Horizon MC252

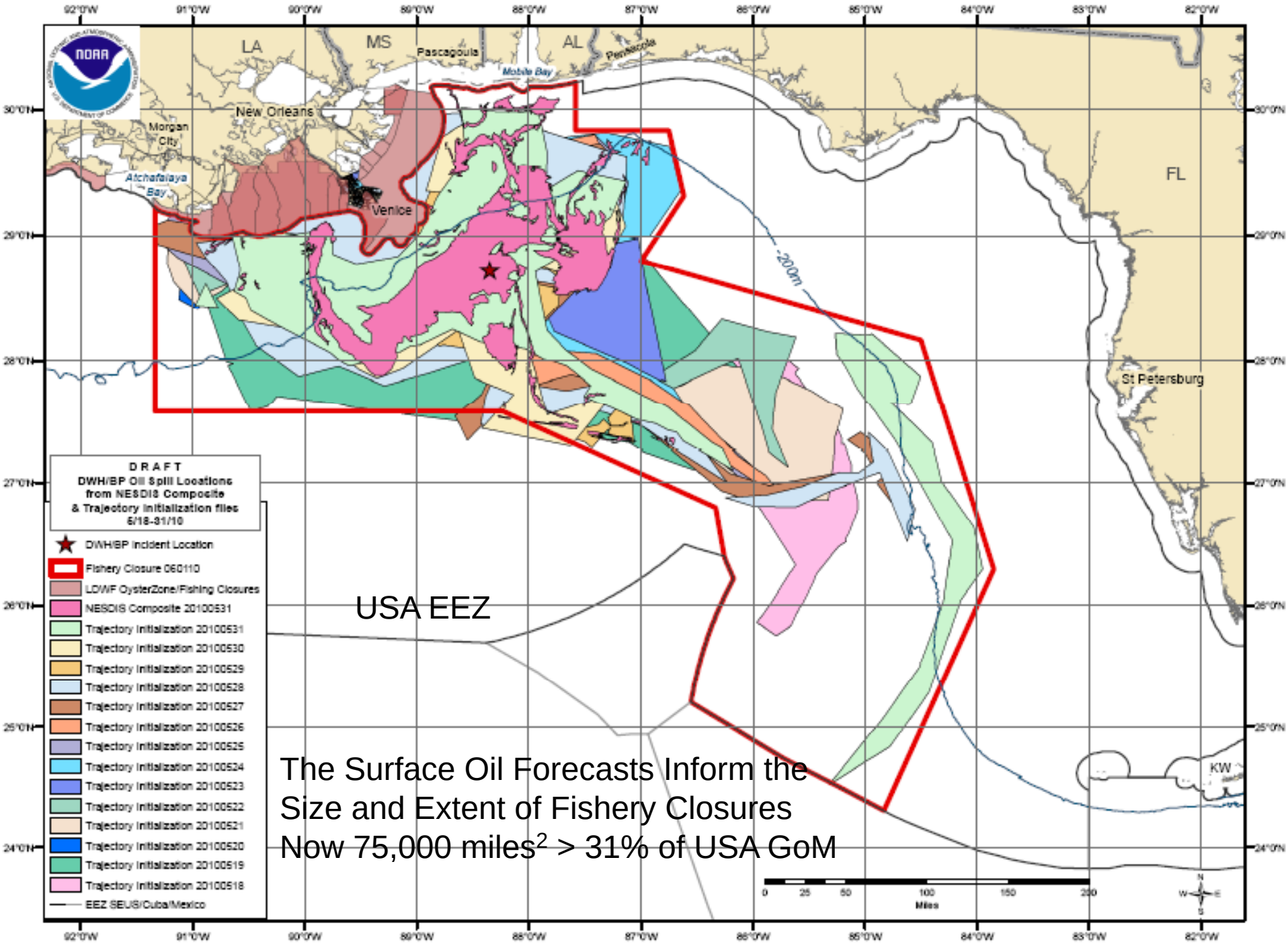
NOAA/NOS/OR&R **Offshore**

Estimate for: 1200 CDT, Friday, 6/04/10
Date Prepared: 1900 CDT, Tuesday, 6/01/10

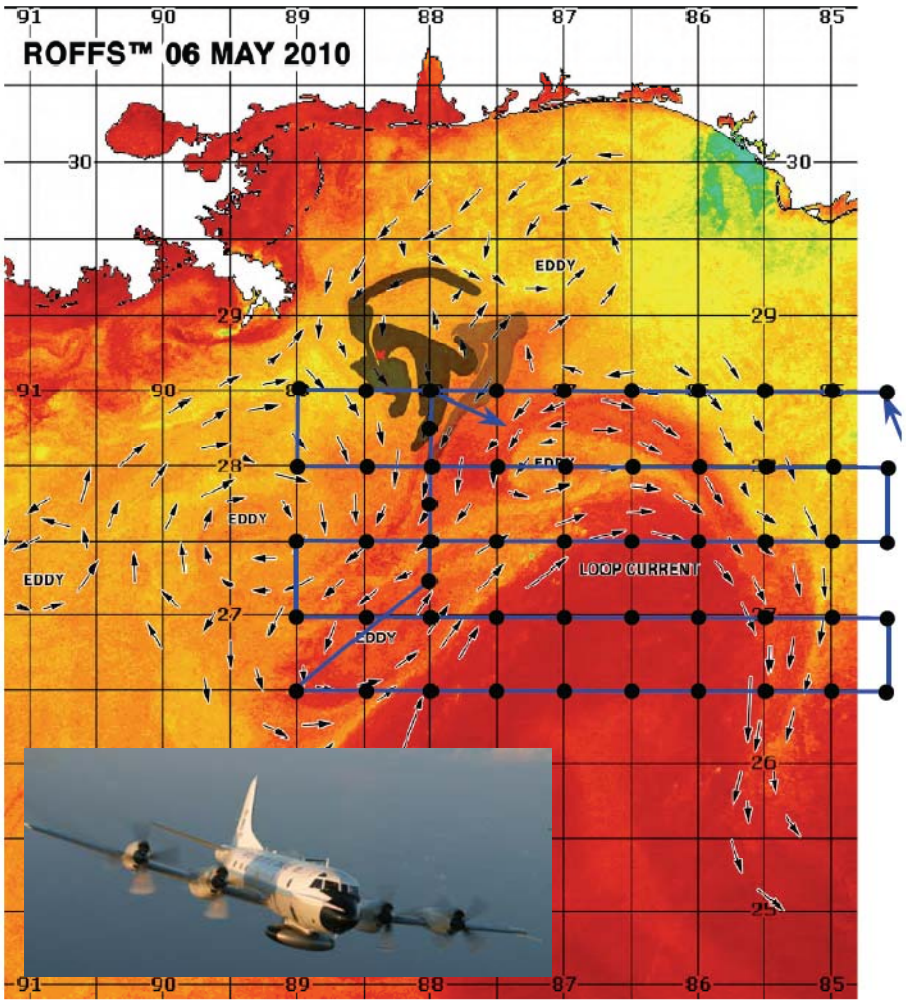
Currents were obtained from three models: NOAA Gulf of Mexico, NavO/NCOM, and NRL/IASNFS. Each includes Loop Current dynamics. Gulf wide winds were obtained from the gridded NCEP product. The model was initialized from Sunday-Tuesday satellite imagery analysis (NOAA/NESDIS). The leading edge may contain tarballs that are not readily observable from the imagery (hence not included in the model initialization).



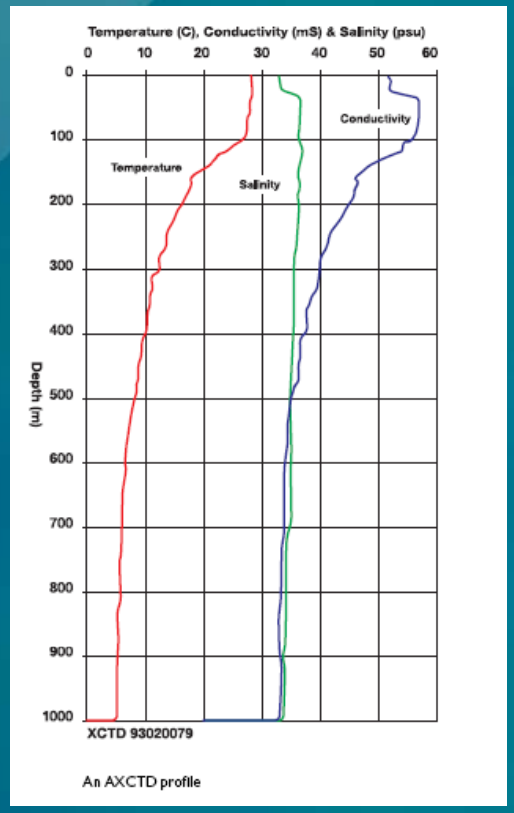
Satellite imagery analysis continues to show narrow bands of oil to the SE and ESE of the main slick. Recent overflights to this region reported only non-contiguous, colorless sheens continuing in narrow bands as seen in the satellite imagery. Trajectories for remaining observed oil within this region suggest these scattered sheens will continue to be entrained in a large clockwise eddy (Eddy Franklin) that has pinched off the main Loop Current. Imagery obtained on May 30 also showed a narrow band of apparent sheen within the clockwise Loop Current eddy (Franklin) as far south as approximately 27 degrees 15 minutes. If this sheen persists or has tarballs associated with it, there is potential for some of it to become entrained into the Loop Current and move toward the Florida Straits.



The Surface Oil Forecasts Inform the Size and Extent of Fishery Closures
Now 75,000 miles^2 > 31% of USA GoM



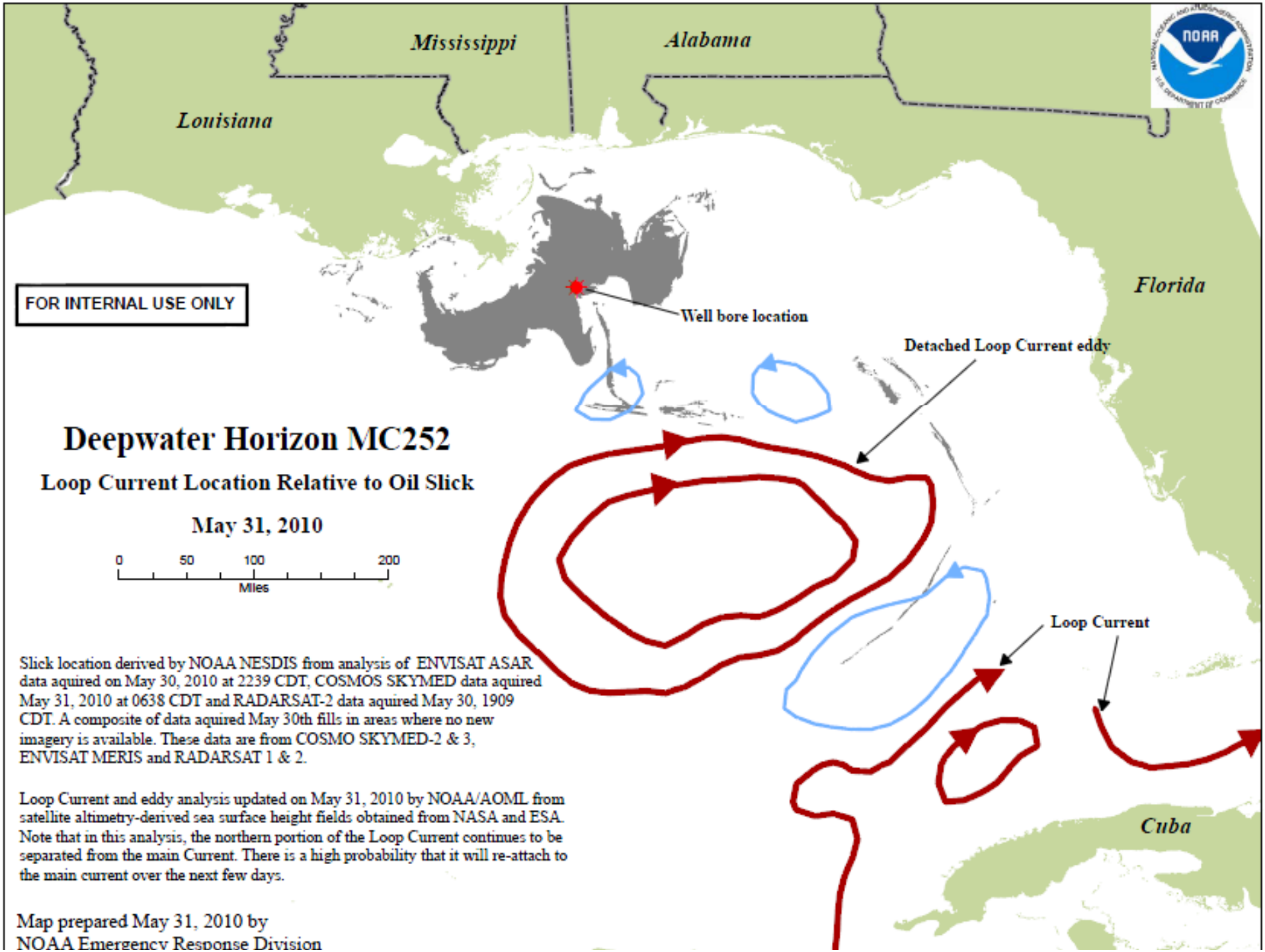
- NOAA WP-3D aircraft deployed airborne expendable current and conductivity with depth probes (AXCP and AXCTD, respectively) to provide deep-water (~1000m) profiles of currents and salinity in the vicinity of the spill and in the Loop Current and its Eddys



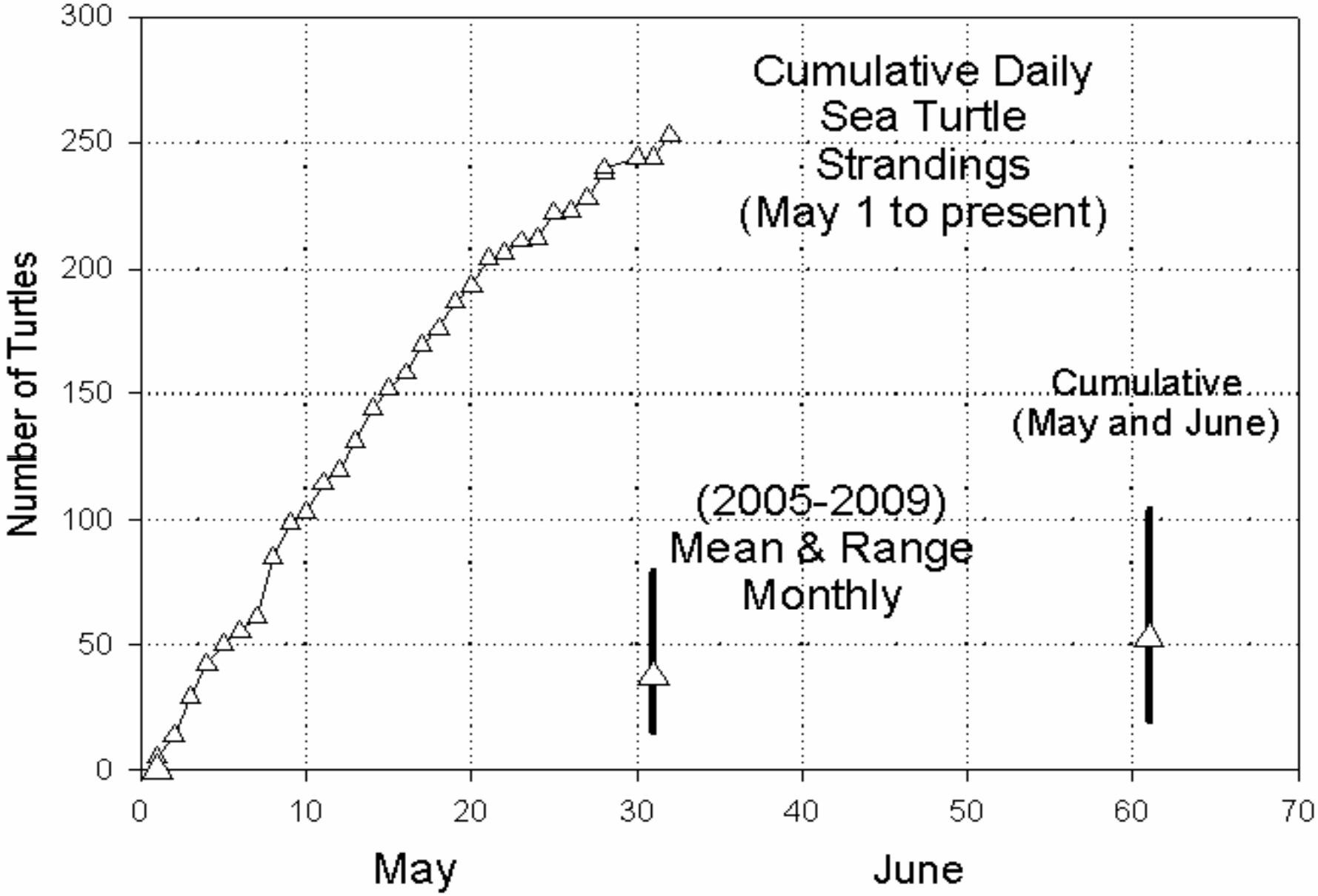
An AXCTD profile

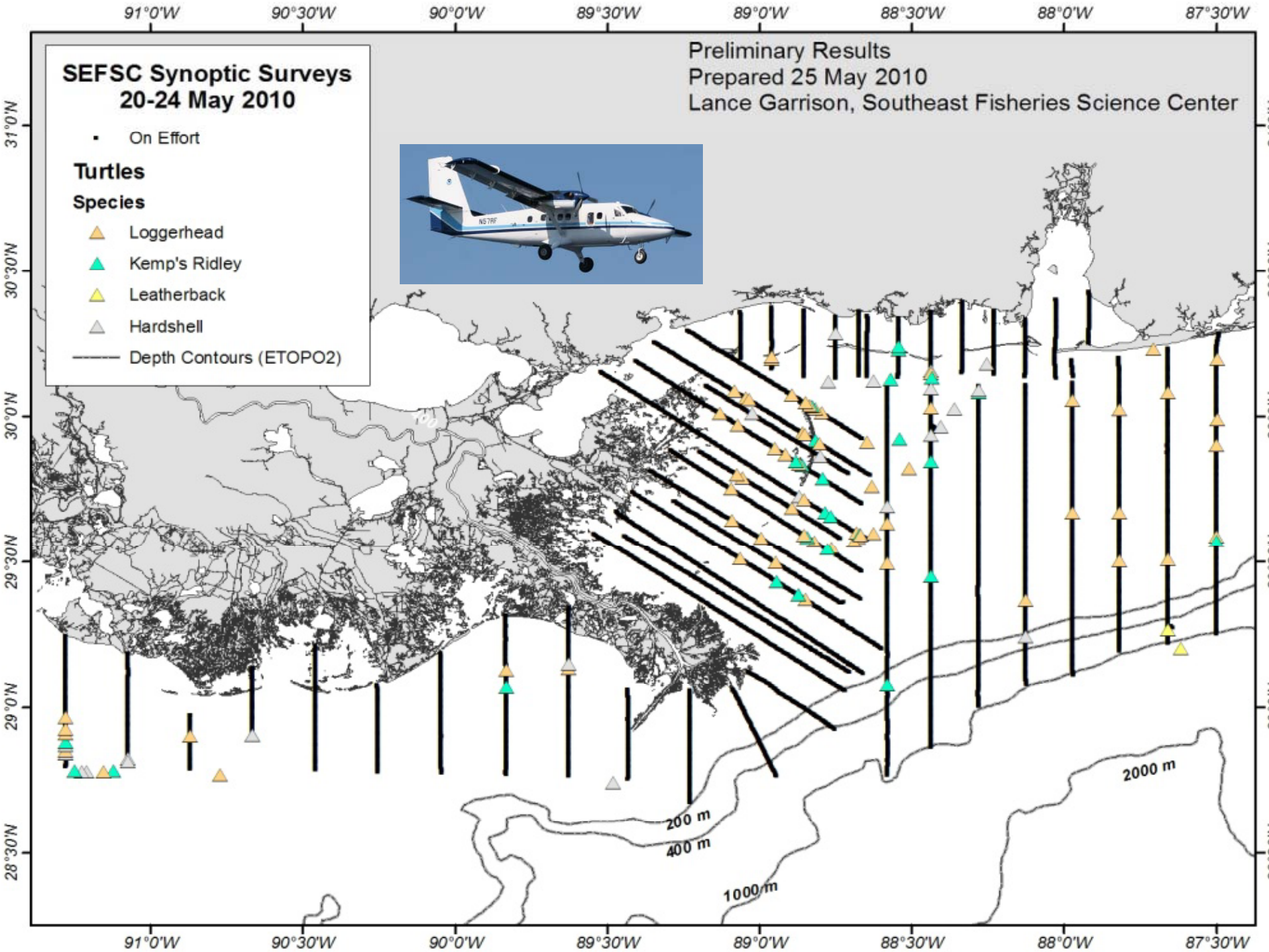
PROBE SPECIFICATIONS

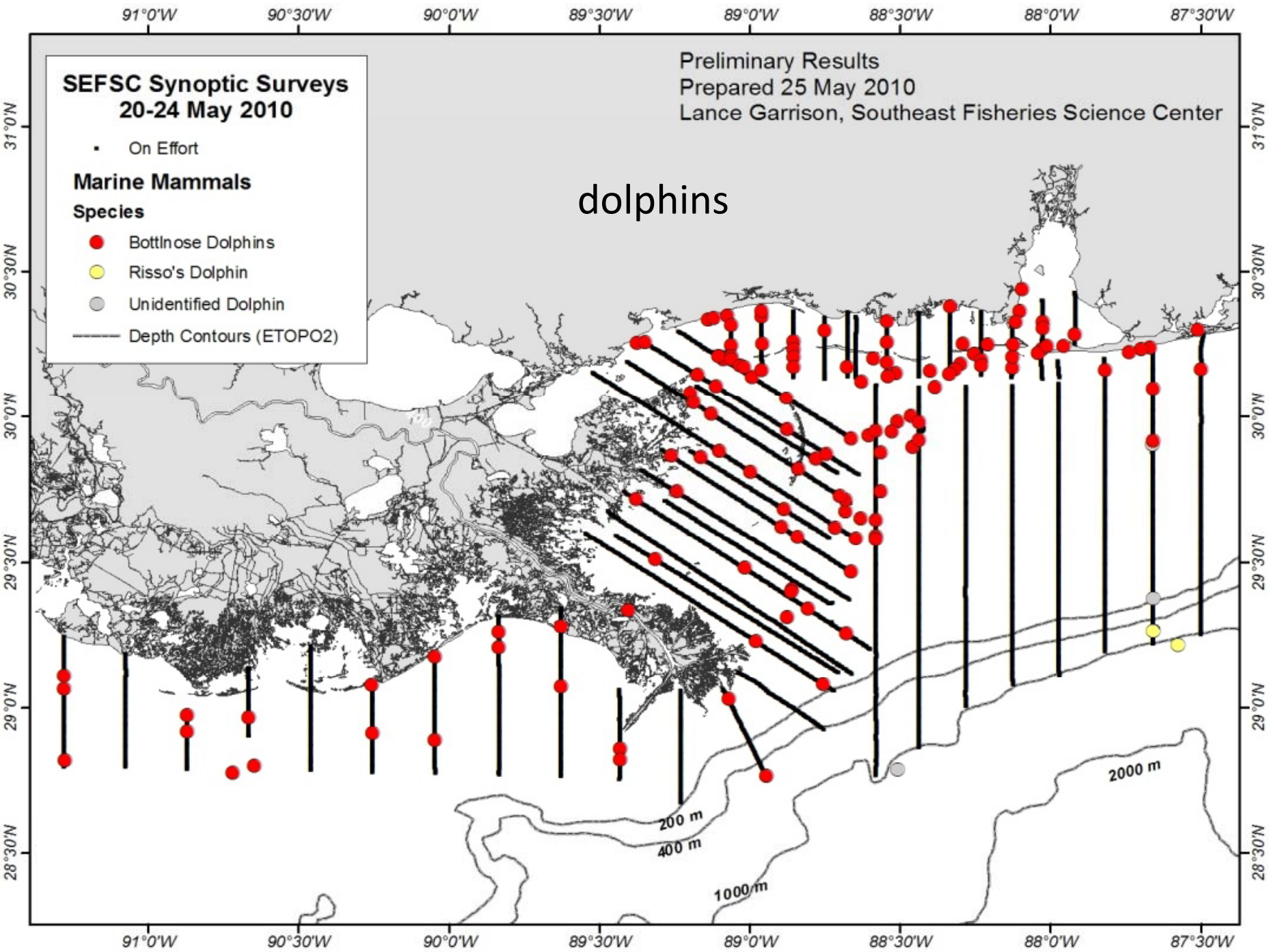
PROBE	PARAMETER	DEPTH	ACCURACY	ACQUISITION SYSTEM
AXCTD	conductivity, temperature	1000 m	-0.035 mS/cm,-0.035°C	MK 12
AXSV	sound velocity	850 m	-0.025 m/sec	MK 12
AXCP	current velocity, temperature	1500 m	-1.0 cm/sec RMS,-0.2 °C	MK 10


Mississippi
Alabama
Louisiana
Florida
Cuba
FOR INTERNAL USE ONLY
Well bore location
Detached Loop Current eddy
Loop Current
Deepwater Horizon MC252
Loop Current Location Relative to Oil Slick
May 31, 2010
0
50
100
200
Miles
Slick location derived by NOAA NESDIS from analysis of ENVISAT ASAR data aquired on May 30, 2010 at 2239 CDT, COSMOS SKYMED data aquired May 31, 2010 at 0638 CDT and RADARSAT-2 data aquired May 30, 1909 CDT. A composite of data aquired May 30th fills in areas where no new imagery is available. These data are from COSMO SKYMED-2 & 3, ENVISAT MERIS and RADARSAT 1 & 2.
Loop Current and eddy analysis updated on May 31, 2010 by NOAA/AOML from satellite altimetry-derived sea surface height fields obtained from NASA and ESA. Note that in this analysis, the northern portion of the Loop Current continues to be separated from the main Current. There is a high probability that it will re-attach to the main current over the next few days.
Map prepared May 31, 2010 by
NOAA Emergency Response Division

Protected Resources a Major Concern



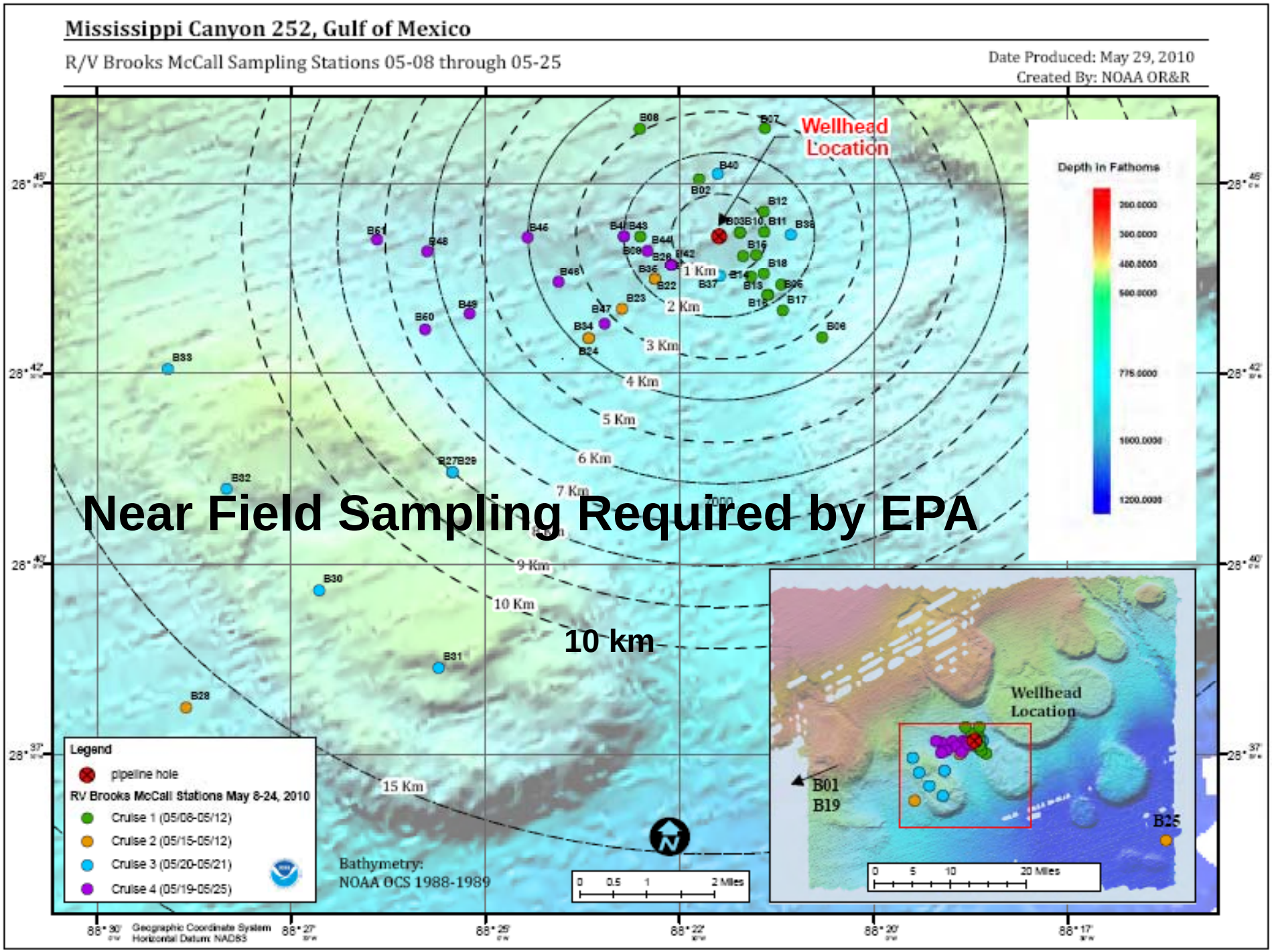

SEFSC Synoptic Surveys
20-24 May 2010
On Effort
Turtles
Species
Loggerhead
Kemp's Ridley
Leatherback
Hardshell
Depth Contours (ETOPO2)
Preliminary Results
Prepared 25 May 2010
Lance Garrison, Southeast Fisheries Science Center
91°0'W
90°30'W
90°0'W
89°30'W
89°0'W
88°30'W
88°0'W
87°30'W
31°0'N
30°30'N
30°0'N
29°30'N
29°0'N
28°30'N
200 m
400 m
1000 m
2000 m

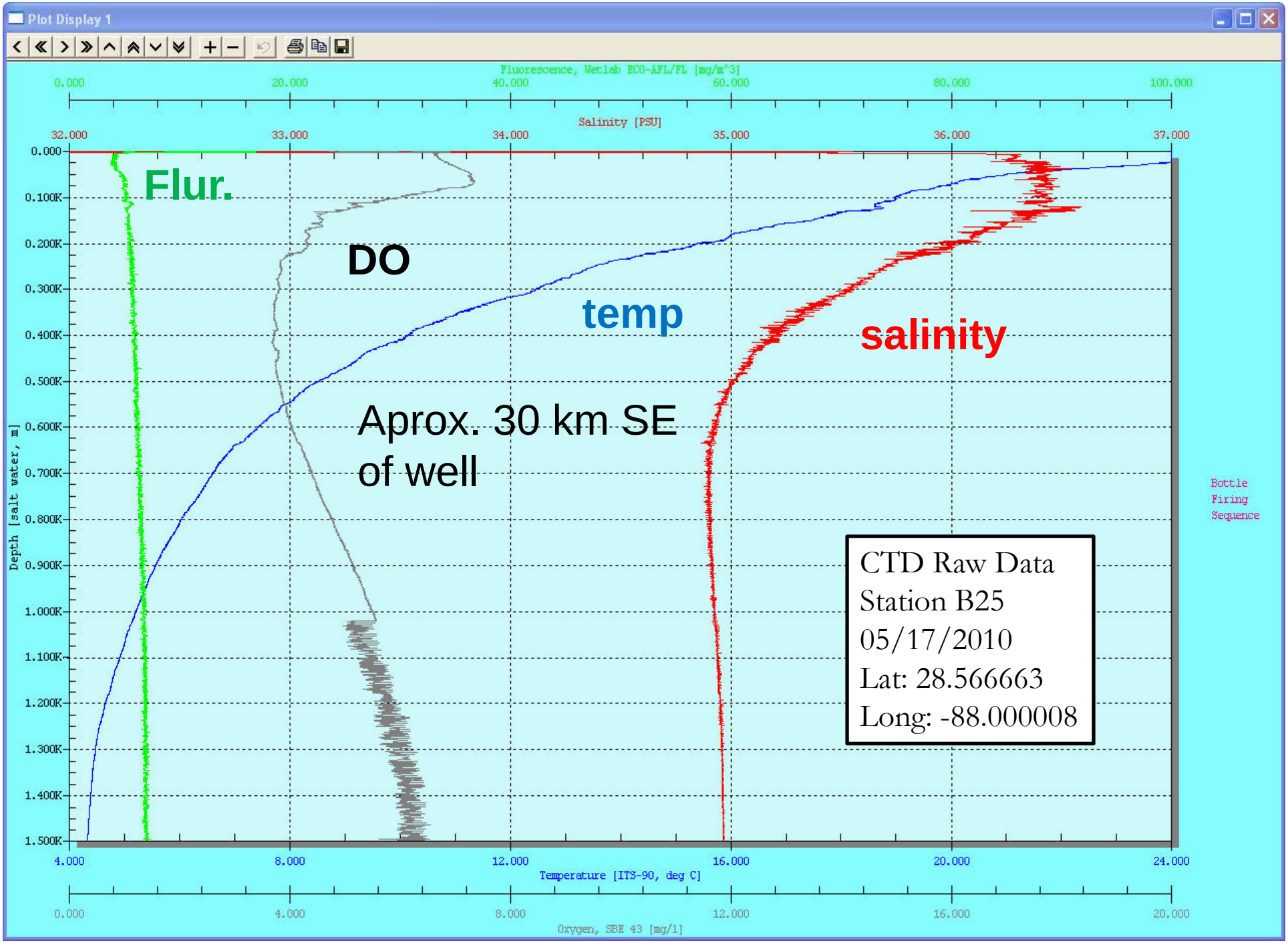

SEFSC Synoptic Surveys
20-24 May 2010
On Effort
Marine Mammals
Species
Bottlnose Dolphins
Risso's Dolphin
Unidentified Dolphin
Depth Contours (ETOPO2)
Preliminary Results
Prepared 25 May 2010
Lance Garrison, Southeast Fisheries Science Center
dolphins
200 m
400 m
1000 m
2000 m
91°0'W
90°30'W
90°0'W
89°30'W
89°0'W
88°30'W
88°0'W
87°30'W
31°0'N
30°30'N
30°0'N
29°30'N
29°0'N
28°30'N

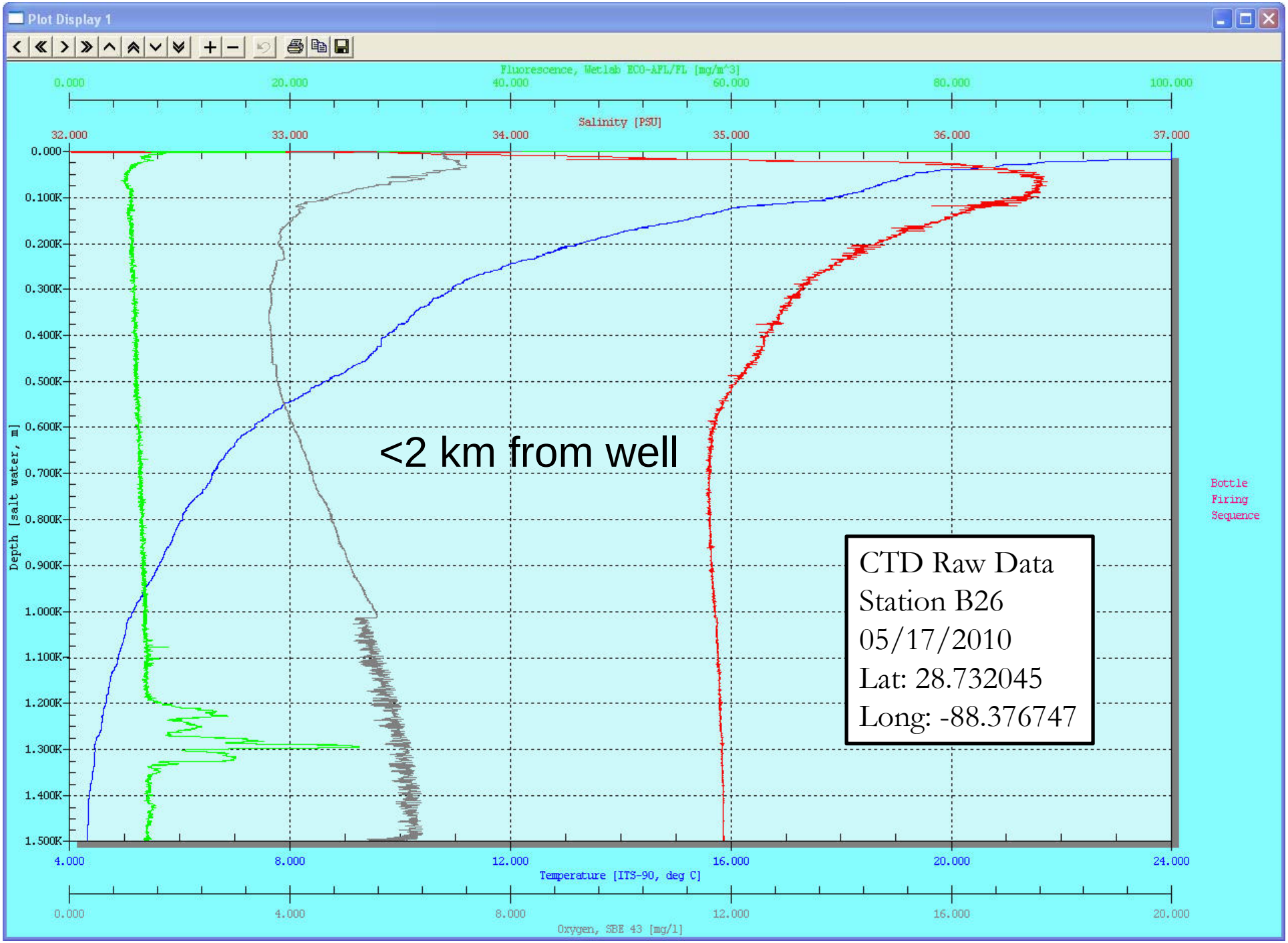
Sub-Surface Sampling for Oil and Dispersants

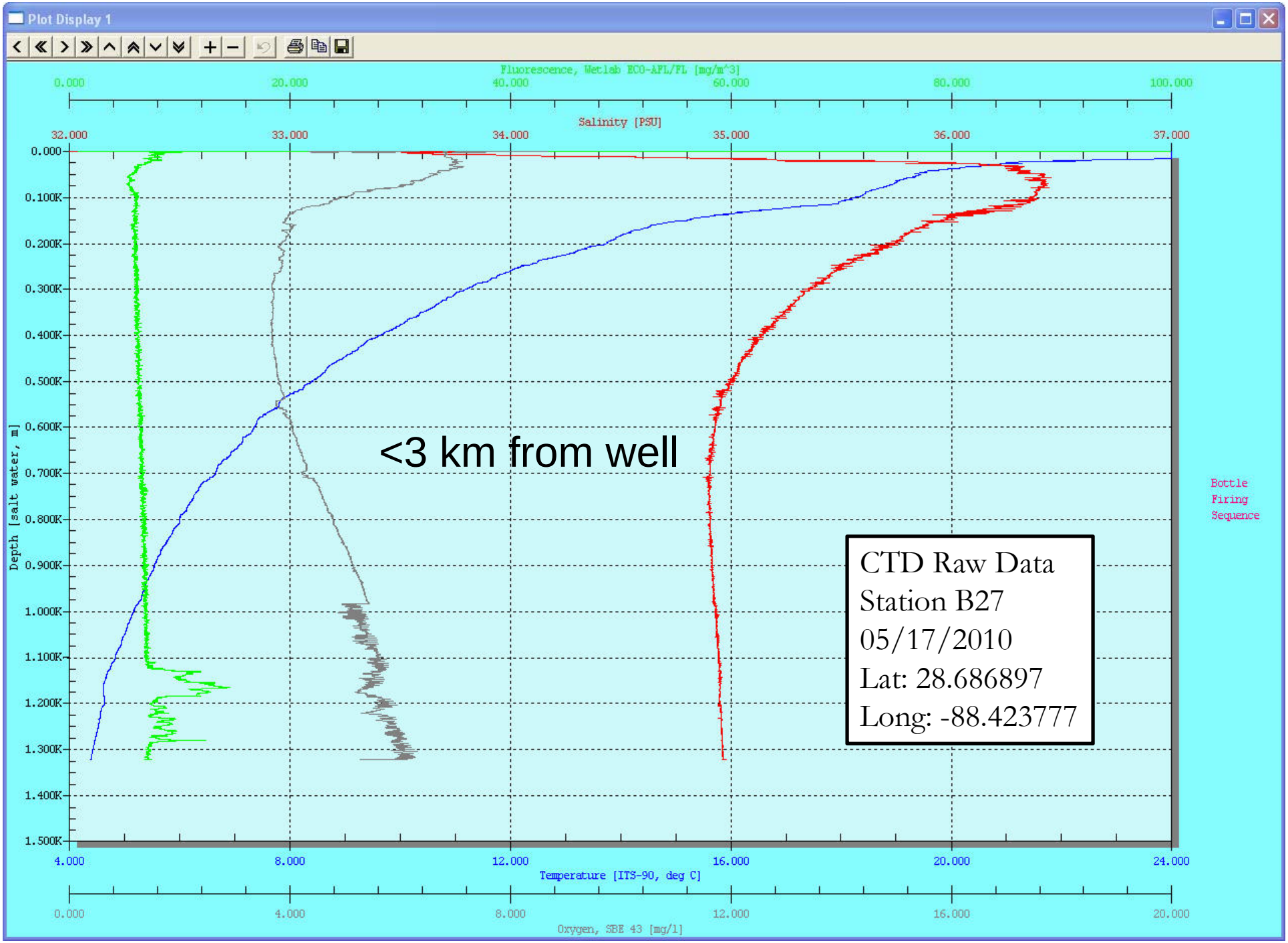
- Required Near-Field sampling for sub-surface dispersant application
- NOAA Research Vessels and NOAA-Sponsored Cruises
- Other sampling Efforts Sponsored by different Agencies

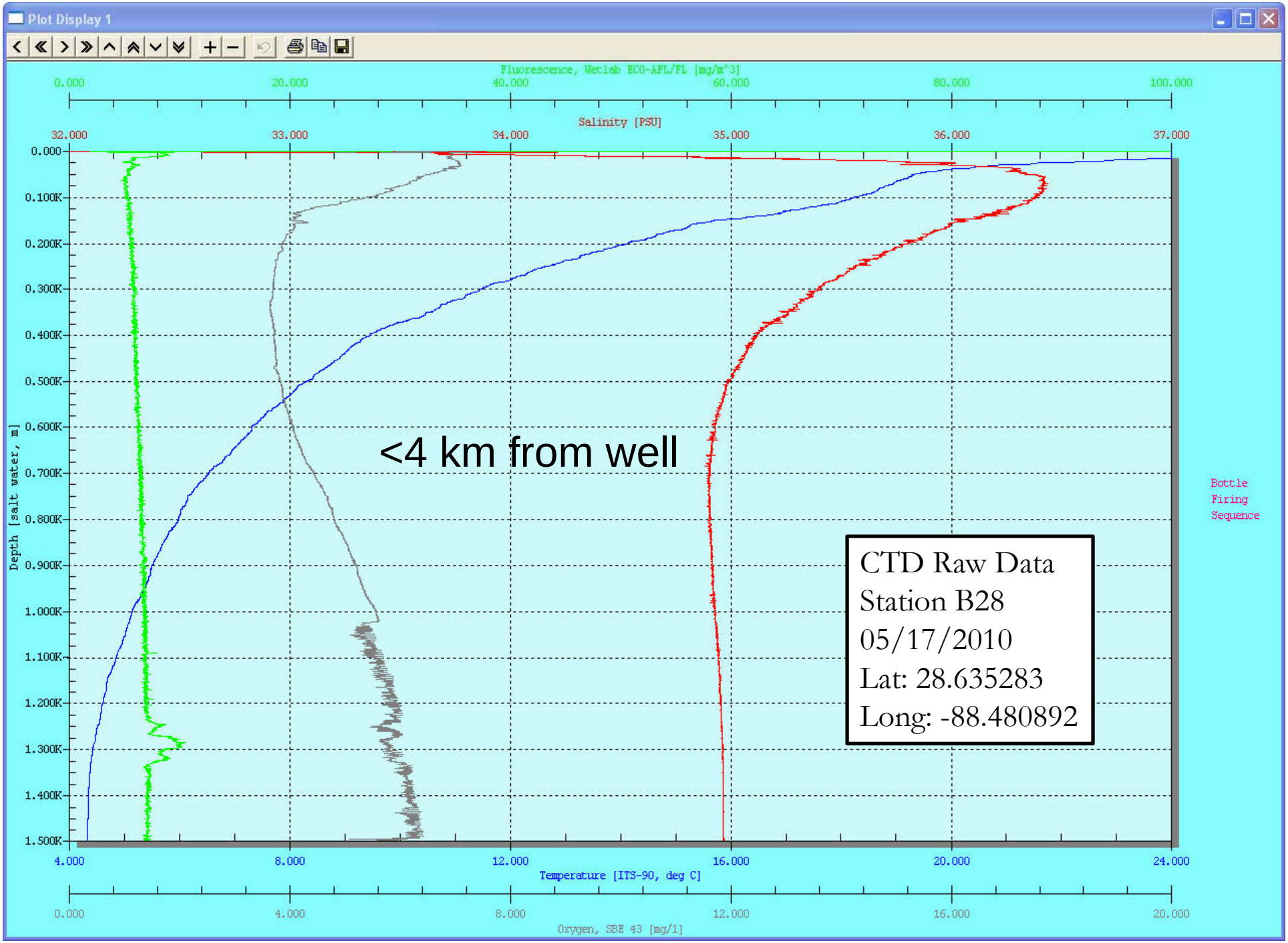
At least 7 research vessels involved in collecting data using a variety of technologies including ship-board acoustics, fluorometry, water sampling using CTD, water sampling with AUV, neuston, Mocness, trawling, and sediment samples

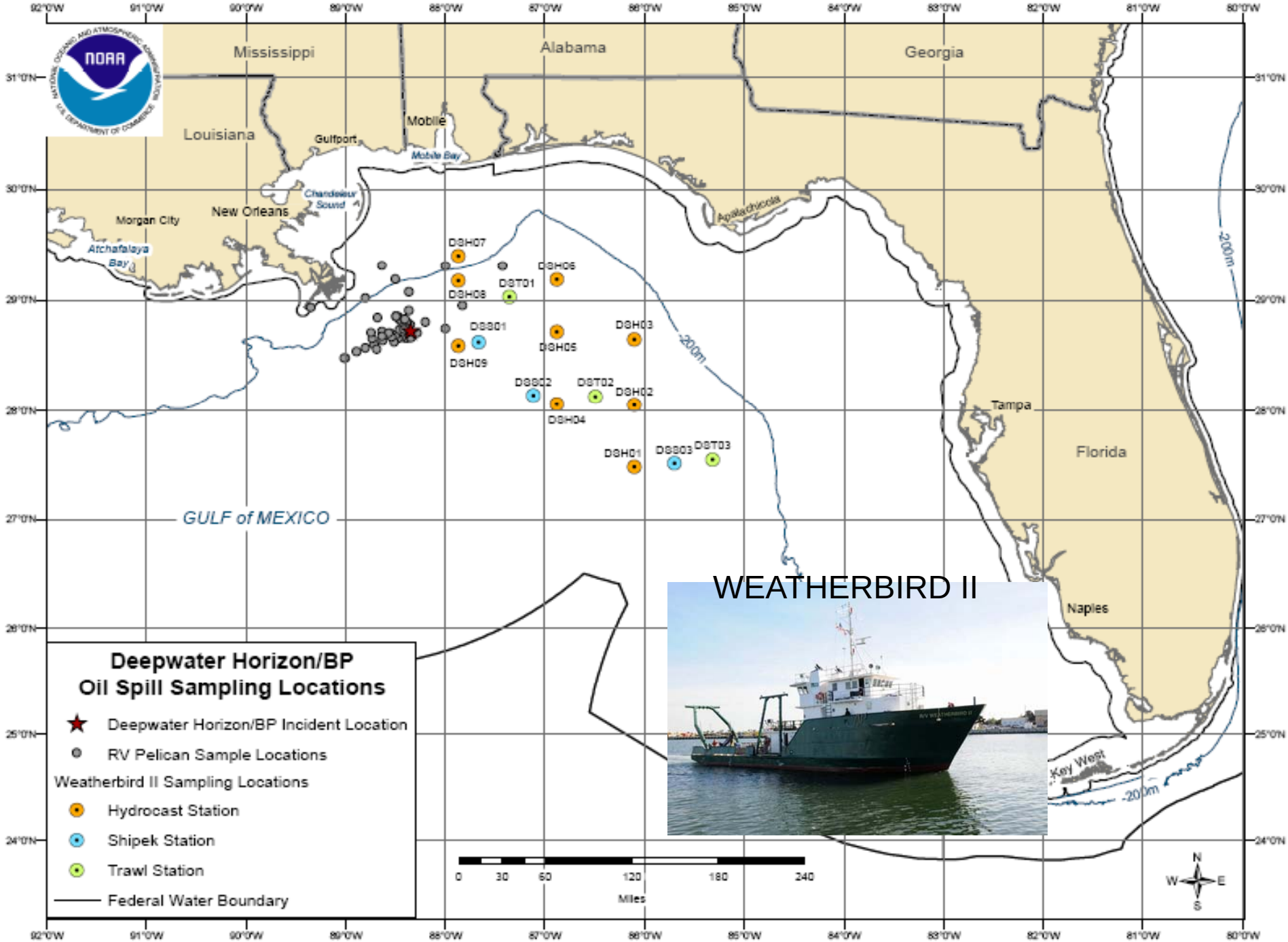

Mississippi Canyon 252, Gulf of Mexico
R/V Brooks McCall Sampling Stations 05-08 through 05-25
Date Produced: May 29, 2010
Created By: NOAA OR&R
Wellhead Location
Depth in Fathoms
Near Field Sampling Required by EPA
10 km
1 Km
2 Km
3 Km
4 Km
5 Km
6 Km
7 Km
9 Km
10 Km
15 Km
Legend
pipeline hole
RV Brooks McCall Stations May 8-24, 2010
Cruise 1 (05/08-05/12)
Cruise 2 (05/15-05/12)
Cruise 3 (05/20-05/21)
Cruise 4 (05/19-05/25)
Bathymetry:
NOAA OCS 1988-1989
Geographic Coordinate System
Horizontal Datum: NAD83
Wellhead Location
B01
B19
B25


Plot Display 1
Fluorescence, Wetlab ECO-AFL/FL [mg/m^3]
0.000
20.000
40.000
60.000
80.000
100.000
Salinity [PSU]
32.000
33.000
34.000
35.000
36.000
37.000
Flur.
DO
temp
salinity
Aprox. 30 km SE
of well
Depth [salt water, m]
0.000
0.100K
0.200K
0.300K
0.400K
0.500K
0.600K
0.700K
0.800K
0.900K
1.000K
1.100K
1.200K
1.300K
1.400K
1.500K
Bottle
Firing
Sequence
CTD Raw Data
Station B25
05/17/2010
Lat: 28.566663
Long: -88.000008
4.000
8.000
12.000
16.000
20.000
24.000
Temperature [ITS-90, deg C]
0.000
4.000
8.000
12.000
16.000
20.000
Oxygen, SBE 43 [mg/l]

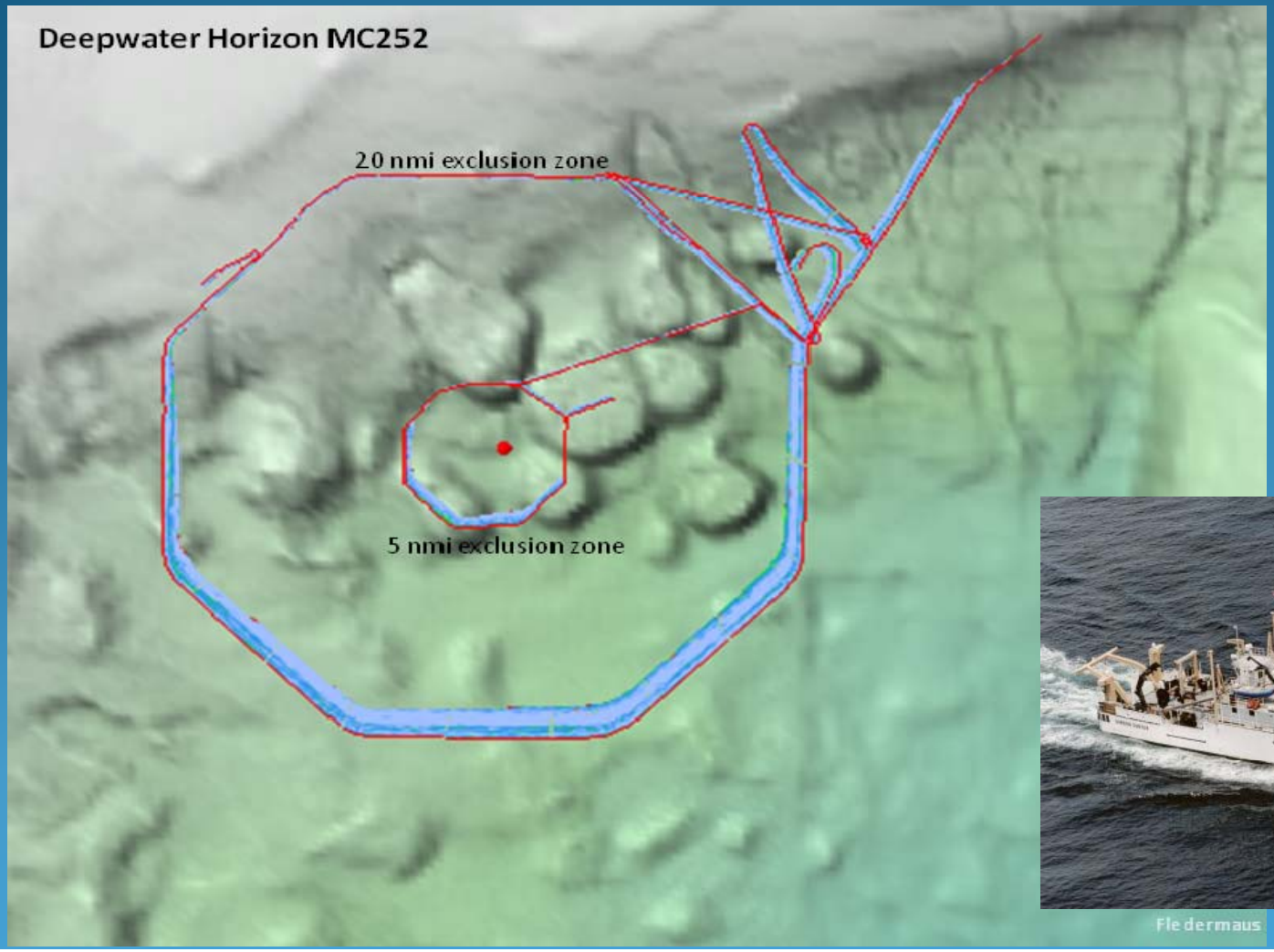

Plot Display 1
Fluorescence, Wetlab ECO-AFL/FL [mg/m^3]
0.000
20.000
40.000
60.000
80.000
100.000
Salinity [PSU]
32.000
33.000
34.000
35.000
36.000
37.000
Depth [salt water, m]
0.000
0.100K
0.200K
0.300K
0.400K
0.500K
0.600K
0.700K
0.800K
0.900K
1.000K
1.100K
1.200K
1.300K
1.400K
1.500K
<2 km from well
Bottle
Firing
Sequence
CTD Raw Data
Station B26
05/17/2010
Lat: 28.732045
Long: -88.376747
4.000
8.000
12.000
16.000
20.000
24.000
Temperature [ITS-90, deg C]
0.000
4.000
8.000
12.000
16.000
20.000
Oxygen, SBE 43 [mg/l]


Plot Display 1
Fluorescence, Wetlab ECO-AFL/FL [mg/m^3]
0.000
20.000
40.000
60.000
80.000
100.000
Salinity [PSU]
32.000
33.000
34.000
35.000
36.000
37.000
Depth [salt water, m]
0.000
0.100K
0.200K
0.300K
0.400K
0.500K
0.600K
0.700K
0.800K
0.900K
1.000K
1.100K
1.200K
1.300K
1.400K
1.500K
<3 km from well
Bottle
Firing
Sequence
CTD Raw Data
Station B27
05/17/2010
Lat: 28.686897
Long: -88.423777
4.000
8.000
12.000
16.000
20.000
24.000
Temperature [ITS-90, deg C]
0.000
4.000
8.000
12.000
16.000
20.000
Oxygen, SBE 43 [mg/l]

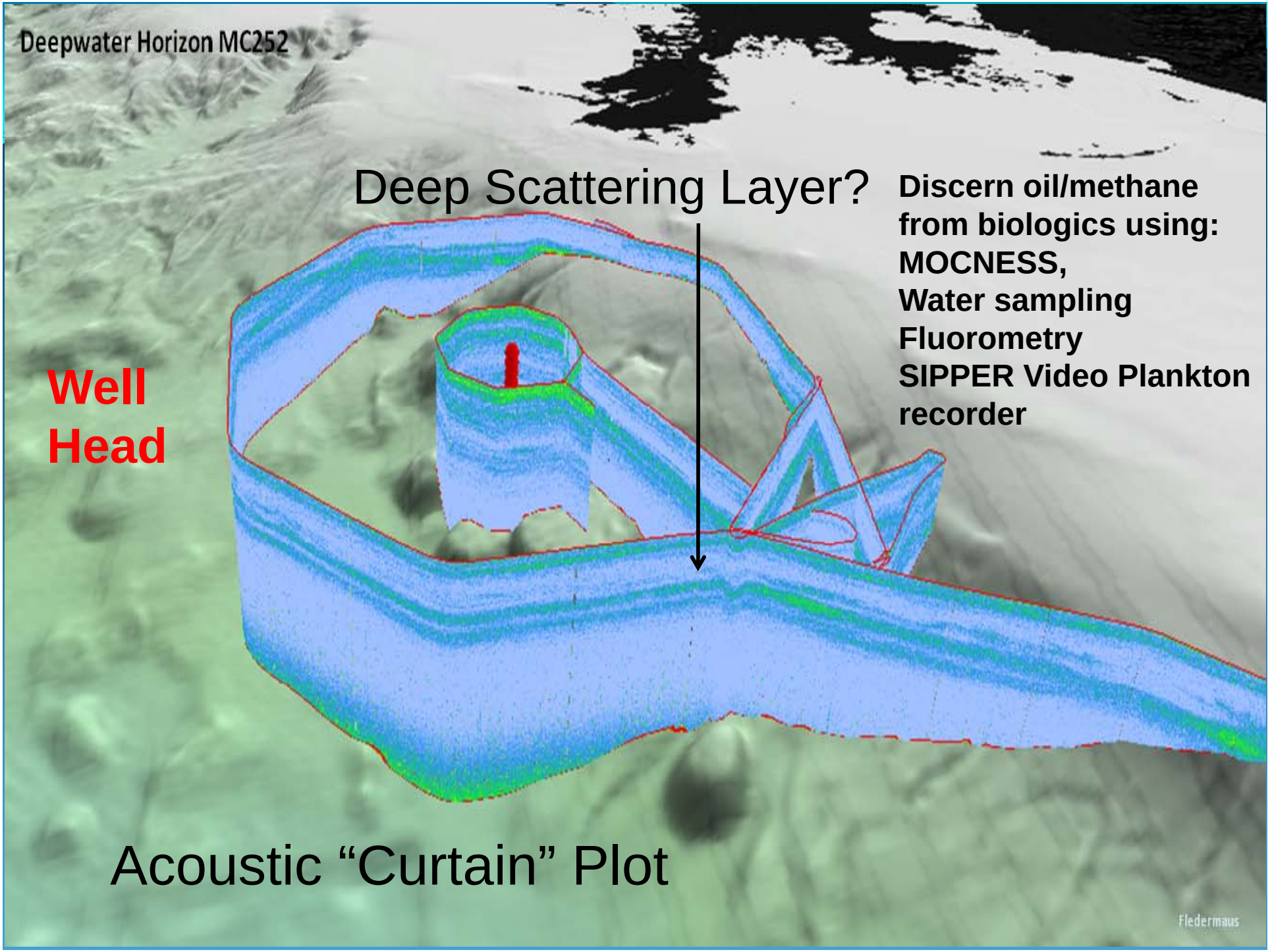

Plot Display 1
Fluorescence, Wetlab ECO-AFL/FL [mg/m^3]
0.000
20.000
40.000
60.000
80.000
100.000
Salinity [PSU]
32.000
33.000
34.000
35.000
36.000
37.000
Depth [salt water, m]
0.000
0.100K
0.200K
0.300K
0.400K
0.500K
0.600K
0.700K
0.800K
0.900K
1.000K
1.100K
1.200K
1.300K
1.400K
1.500K
<4 km from well
Bottle
Firing
Sequence
CTD Raw Data
Station B28
05/17/2010
Lat: 28.635283
Long: -88.480892
4.000
8.000
12.000
16.000
20.000
24.000
Temperature [ITS-90, deg C]
0.000
4.000
8.000
12.000
16.000
20.000
Oxygen, SBE 43 [mg/l]

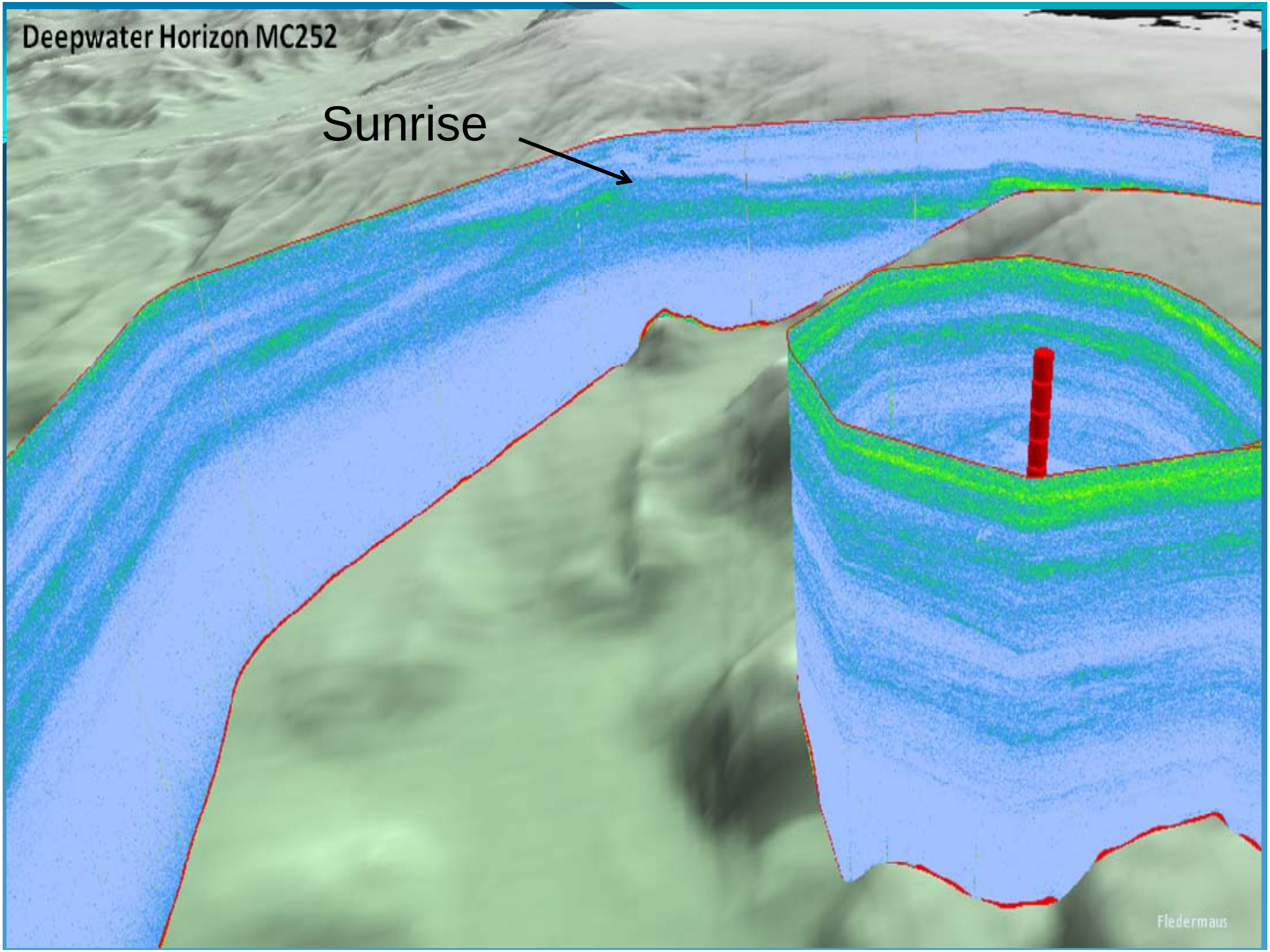

Mississippi
Alabama
Georgia
Louisiana
Florida
Mobile
Gulfport
Mobile Bay
Chandeleur Sound
New Orleans
Morgan City
Atchafalaya Bay
Apalachicola
Tampa
Naples
Key West
GULF of MEXICO
-200m
DSH07
DSH06
DSH08
DST01
DSS01
DSH05
DSH03
DSH09
DSS02
DST02
DSH02
DSH04
DSH01
DSS03
DST03
WEATHERBIRD II
Deepwater Horizon/BP
Oil Spill Sampling Locations
Deepwater Horizon/BP Incident Location
RV Pelican Sample Locations
Weatherbird II Sampling Locations
Hydrocast Station
Shipek Station
Trawl Station
Federal Water Boundary
0 30 60 120 180 240
Miles
N
W
E
S

Acoustics Cruise aboard GORDON GUNTER 20 nm ring then 5 nm ring

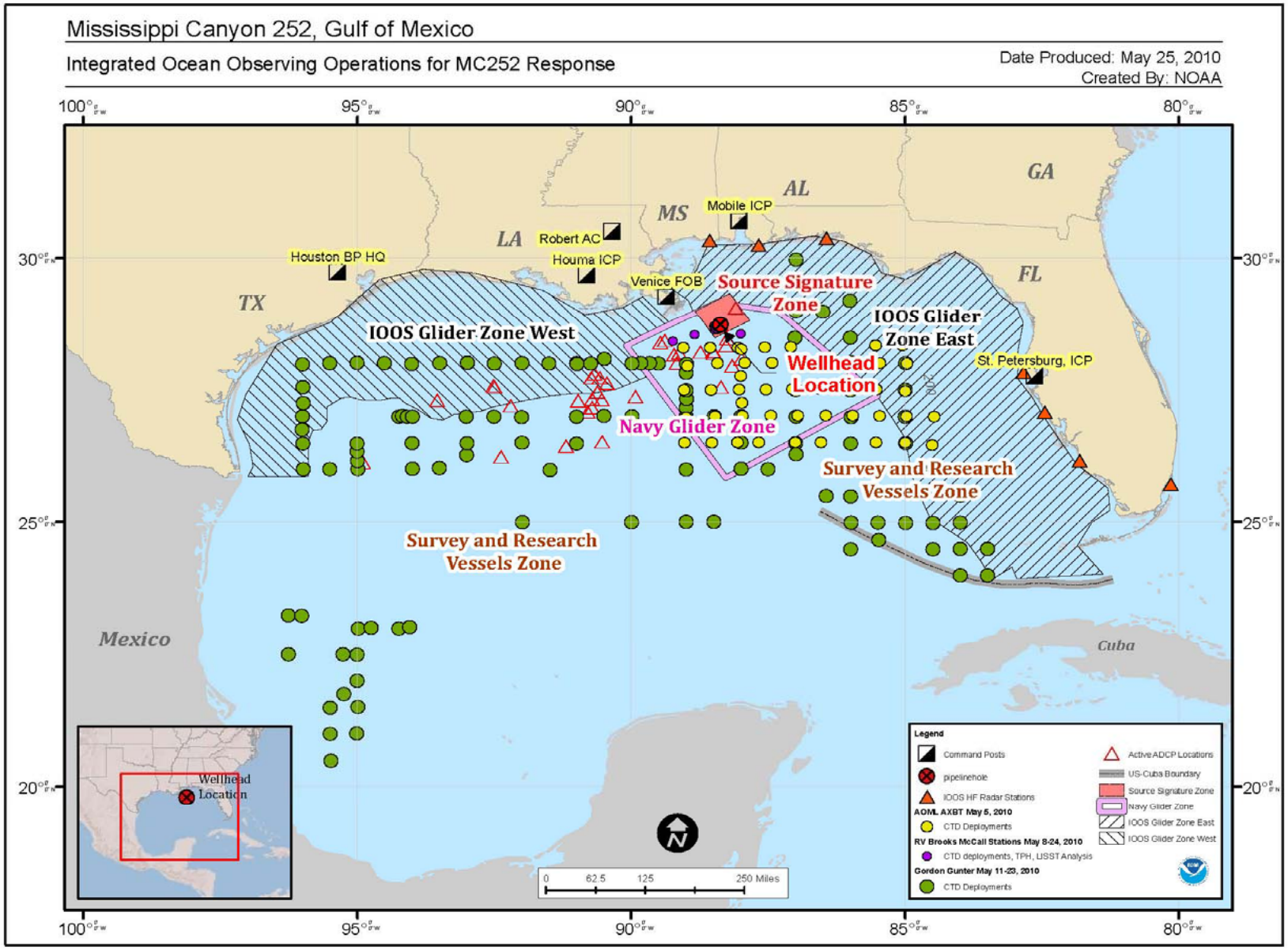


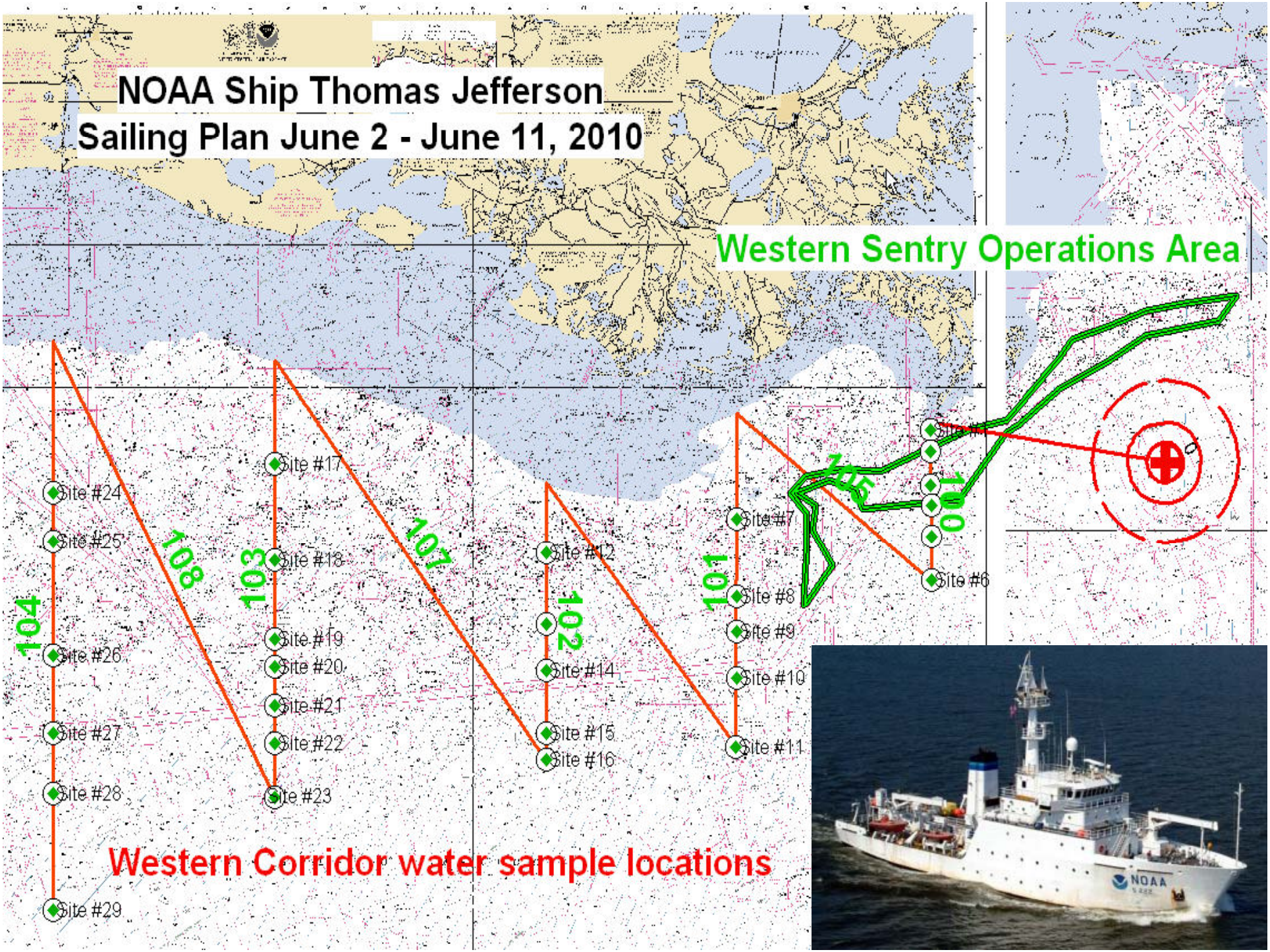
Fledermaus


Deepwater Horizon MC252
Deep Scattering Layer?
Discern oil/methane from biologics using:
MOCNESS,
Water sampling
Fluorometry
SIPPER Video Plankton recorder
Well Head
Acoustic "Curtain" Plot
Fledermaus


Deepwater Horizon MC252
Sunrise
Fledermaus

need greater awareness of sampling assets




NOAA Ship Thomas Jefferson
Sailing Plan June 2 - June 11, 2010
Western Sentry Operations Area
Western Corridor water sample locations
Site #1
Site #6
Site #7
Site #8
Site #9
Site #10
Site #11
Site #12
Site #14
Site #15
Site #16
Site #17
Site #18
Site #19
Site #20
Site #21
Site #22
Site #23
Site #24
Site #25
Site #26
Site #27
Site #28
Site #29
101
102
103
104
105
106
107
108
NOAA

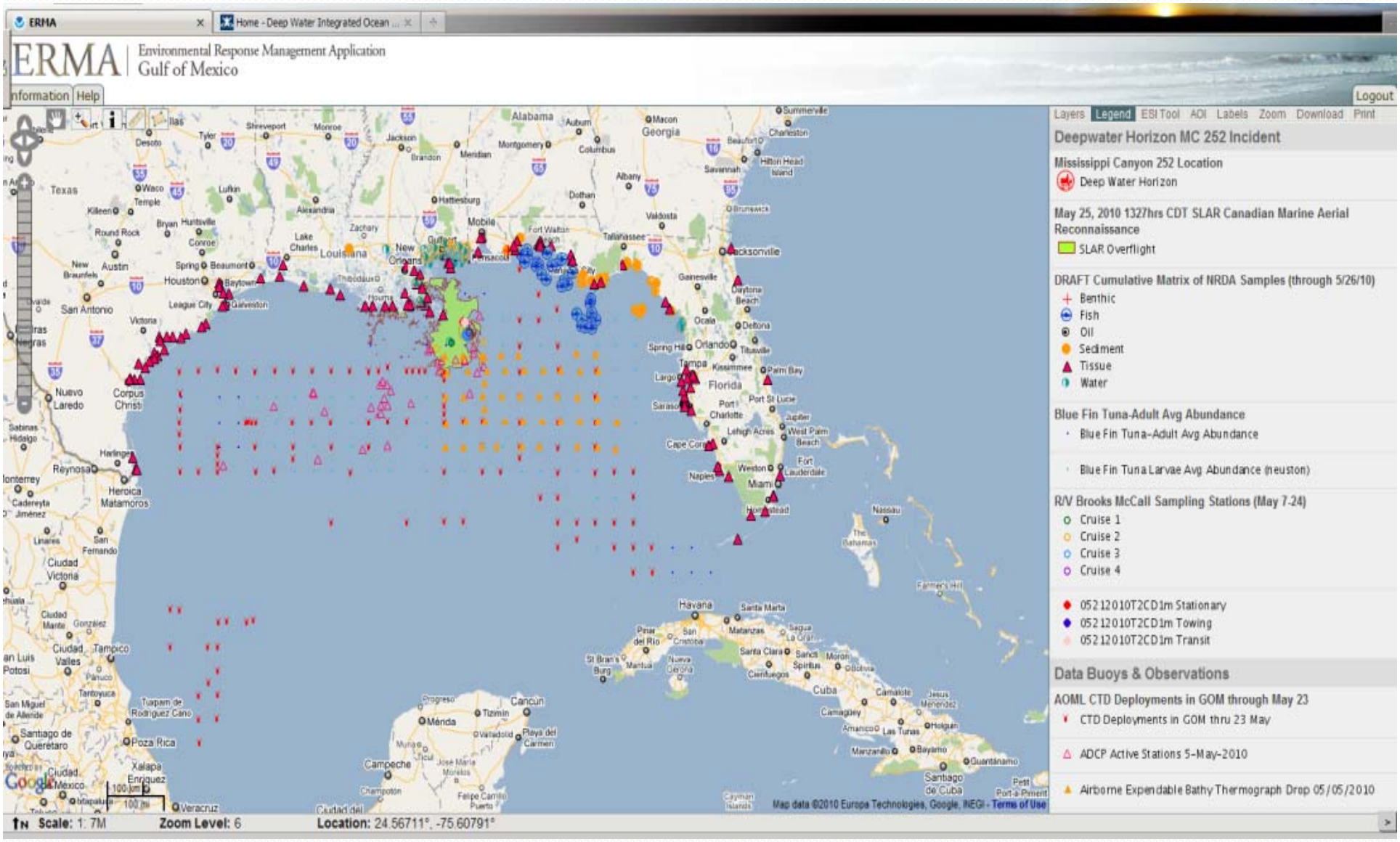
Where are we now with Sub-Surface Sampling?

- All actual sub-surface water sampling results to date indicate low ppm (very near field) to ppb-ppt farther, to negative results (far-field). "Fingerprinting" of MC-252 oil critical
- Considerable numbers of government, BP and academic assets now devoted to this activity with more being proposed each day
- Some data already collected not usable because of collection and storage protocols
- Tactical situation confused by natural oil/methane, other organic compounds (plasticizers) and biologics in the water column
- Suggest we set up a workshop to review results and harmonize approaches to date before any additional cruises are planned except for required monitoring activities

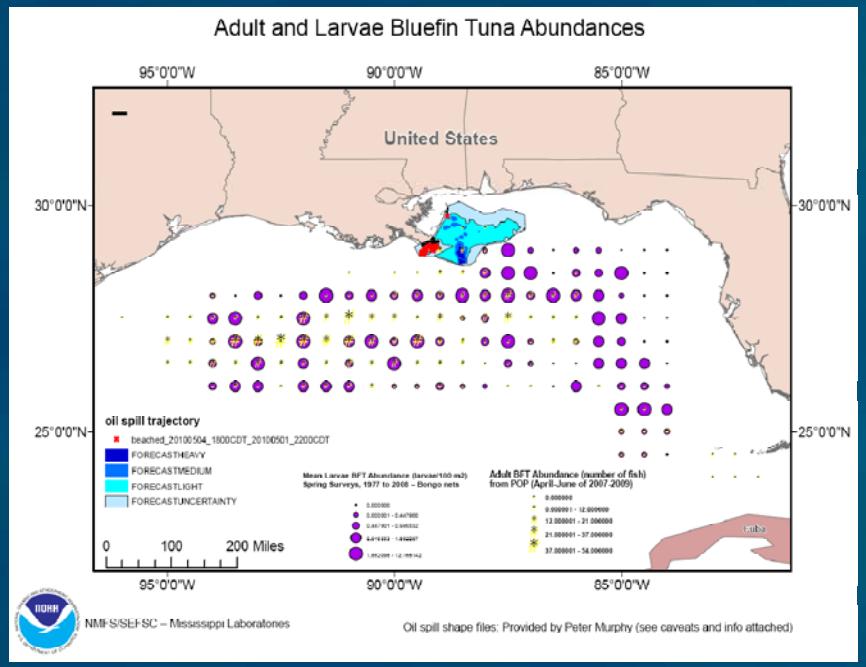
Near-Term Science Actions (1-6 months)

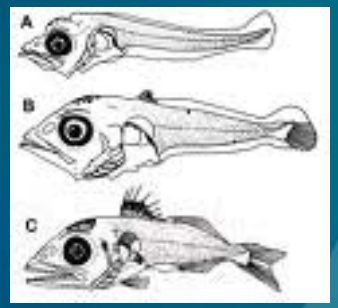
- Continued scientific support to the IC through USCG Federal On-Scene Coordinator (including trajectory predictions, Loop Current evaluation, predicted shore line impacts, etc.).
- Mass balance calculations to understand surface and sub-surface fractions of total release
- Continued assessment of shoreline oil impacts and support for scientifically appropriate clean-up actions
- Additional studies of the impacts of dispersants
- Continued surveys to assess the magnitude, characteristics, fate, transport and near-term effects of subsurface dispersed oil
- Longitudinal surveys of potential oil and dispersants in seafood species in closed and open areas
- Identification and initiation of studies to quantify natural resource injuries
- Additional human dimensions studies to understand the impact of the event on coastal communities

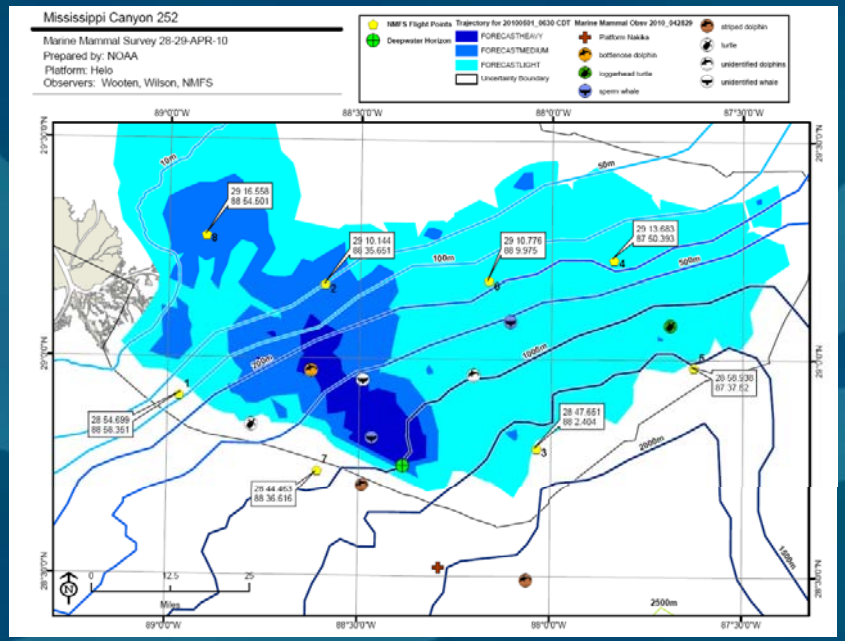
To Date Collected over 2000 baseline samples



Over 800,000 gallons of dispersants used surface & subsurface
Are there tipping points in the ecosystem?







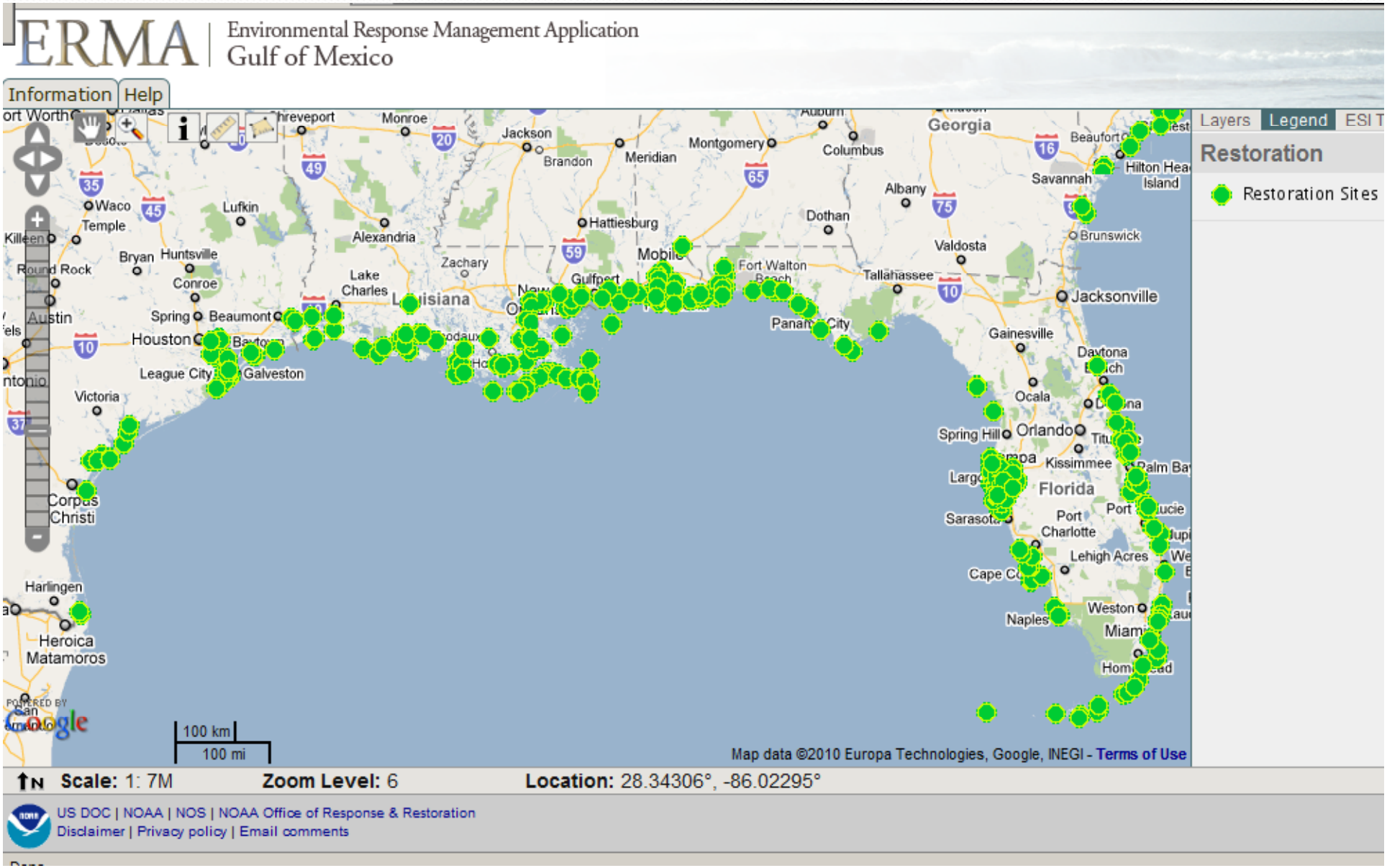
Deep water giant squid

- What living resources are potentially at risk from the oil and use of dispersants and their synergy?
- BFT spawning in the region offshore from the spill from April-June – NOAA FSV GORDON GUNTER cruise completed
- Samples of sperm whale tissue and squids available from cruise last summer and winter as baselines
- Overflights continue to monitor protected species

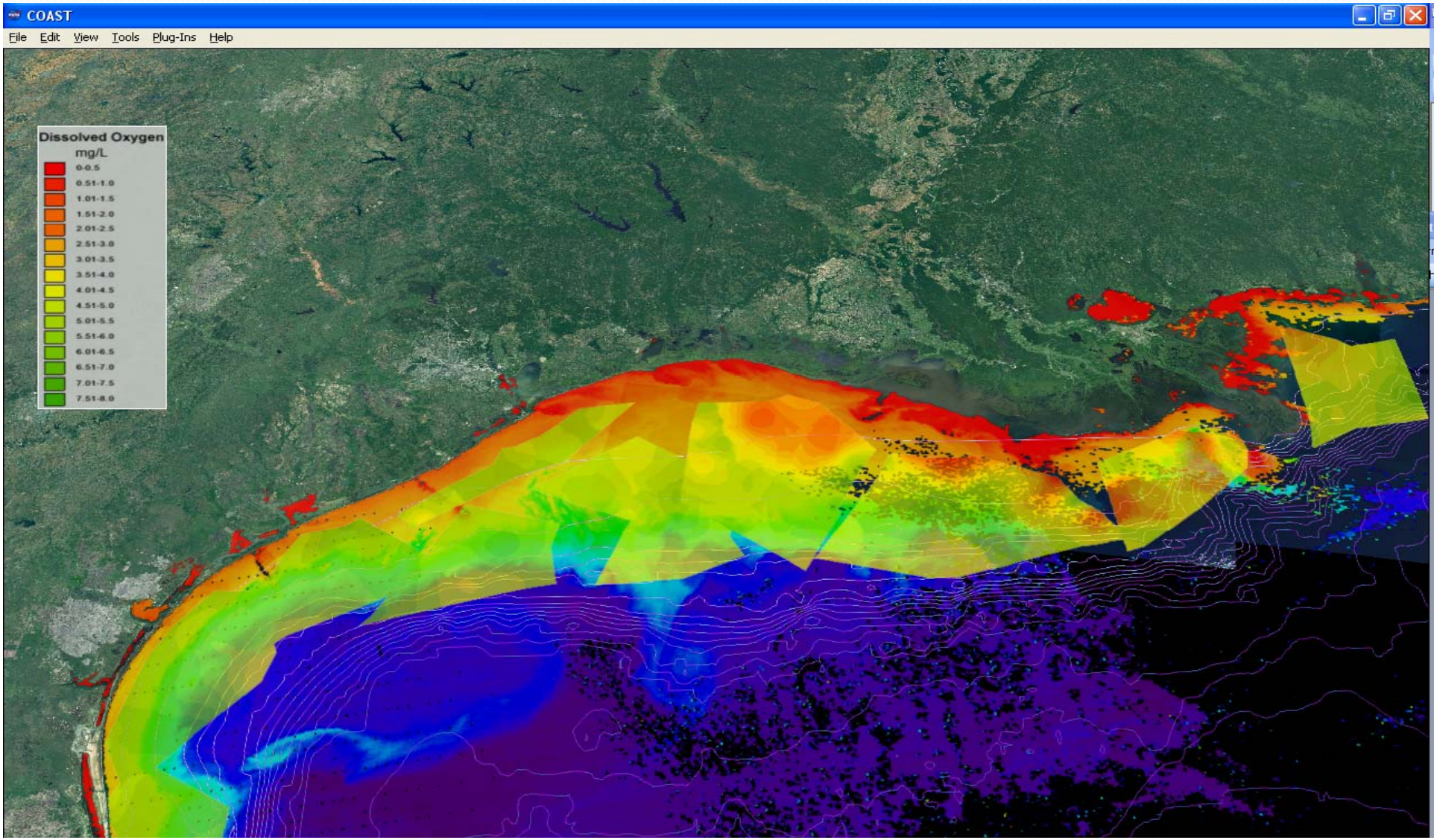
Long-Term Science Issues (2 months to decades)

- Ecosystem-level Impacts of the spill
  - Impacts of the spill on productivity, nutrient cycling and species composition near and off-shore habitats
  - Impacts of the spill on productivity, nutrient cycling and species composition of Louisiana marshes
- Development and implementation of ecosystem-level restoration opportunities for the Northern Gulf of Mexico
- Studies to identify on long-term effects of introduction of tons of reduced carbon into the Gulf ecosystem
  - Effects on Hypoxia distribution and seasonality in the GOM
  - Effects on HABs and other human health pathogens
- Mid to long term socio-economic impacts of the spill on coastal Gulf Coast States

Many Restoration Sites Already Exist – Best Remediation Practices?



Effects of Spill on an area already challenged by hypoxia



We Need a more Holistic Ecosystem Approach to Understanding Long-Term Impacts of MC-252