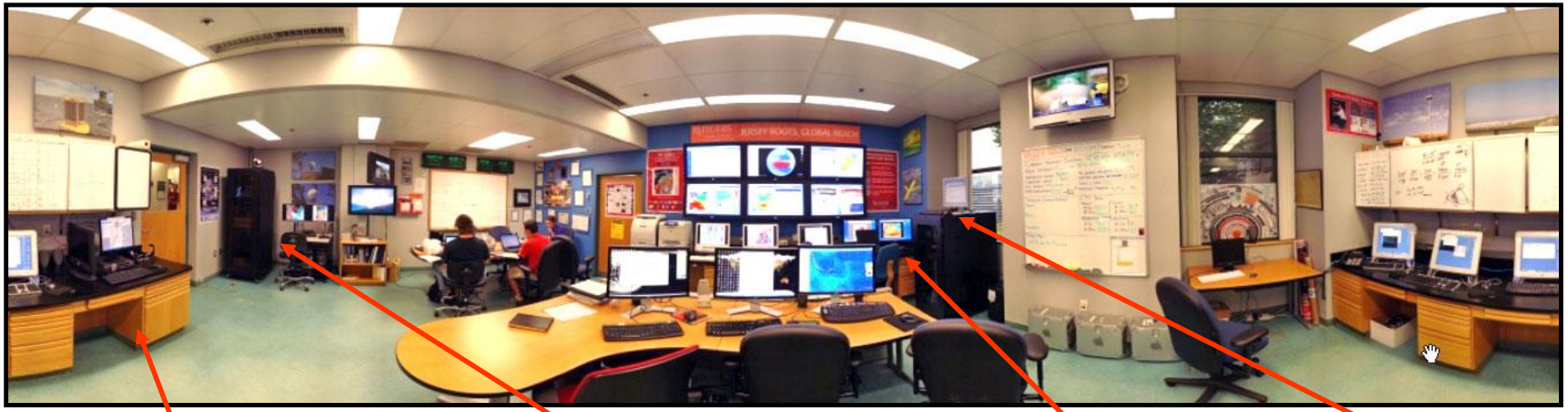
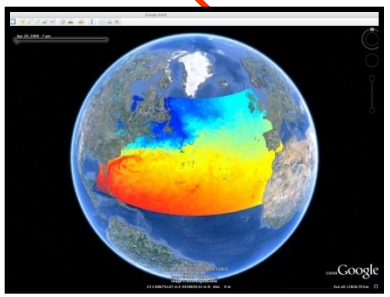
Coordinated Response to the Deepwater Horizon Oil Spill

Rutgers University - Coastal Ocean Observation Lab

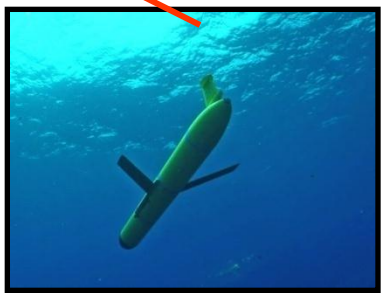


CODAR Network

L-Band & X-Band Satellite Receivers



3-D Nowcasts & Forecasts



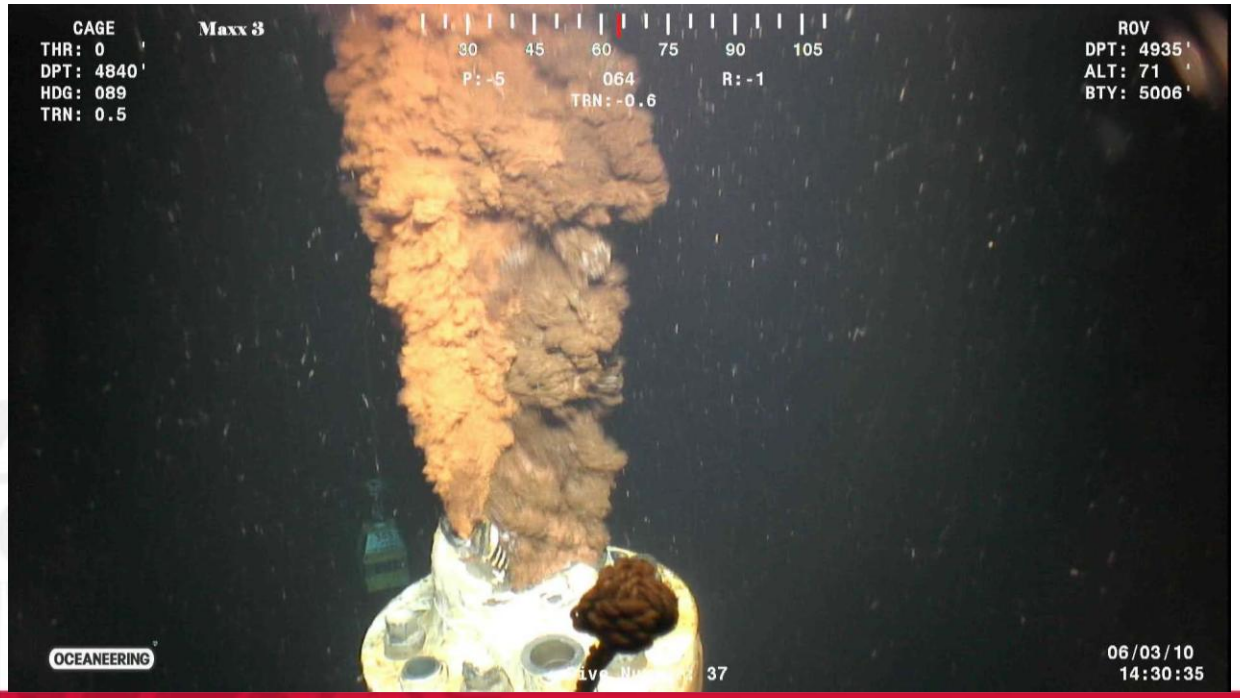
Glider Fleet

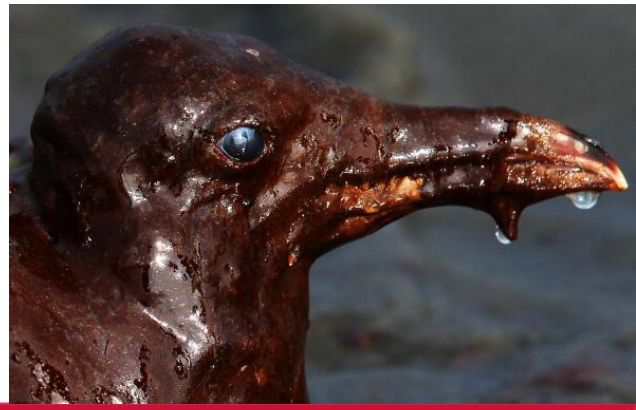
Blowout & Fire on the Deepwater Horizon Platform: April 20, 2010

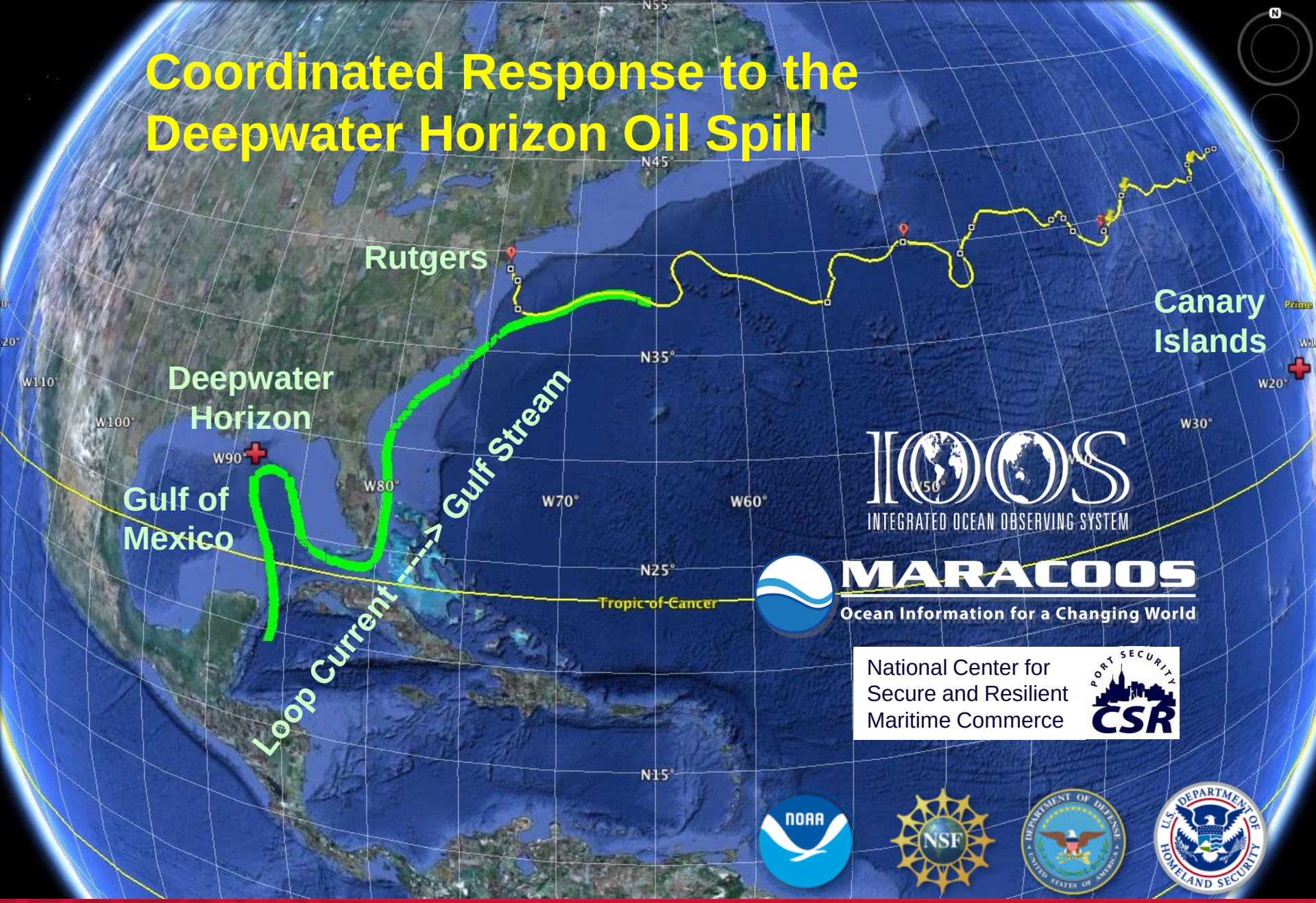
Deepwater Horizon Oil Spill

- Blowout on April 20, 2010.
- Well declared sealed on September 19, 2010.
- 4.9 M Barrels of Sweet Heavy Crude Released.
- 18.7 times the Exxon Valdez off Alaska.
- 7.4 times the Prestige off Galicia.

Worst Environmental Catastrophe in U.S. History






Coordinated Response to the Deepwater Horizon Oil Spill
Rutgers
Canary Islands
Deepwater Horizon
Gulf of Mexico
Loop Current ---> Gulf Stream
Tropic of Cancer
N55°
N45°
N35°
N25°
N15°
W110°
W100°
W90°
W80°
W70°
W60°
W30°
W20°
IOOS
INTEGRATED OCEAN OBSERVING SYSTEM
MARACOOS
Ocean Information for a Changing World
National Center for Secure and Resilient Maritime Commerce
CSR
NOAA
NSF

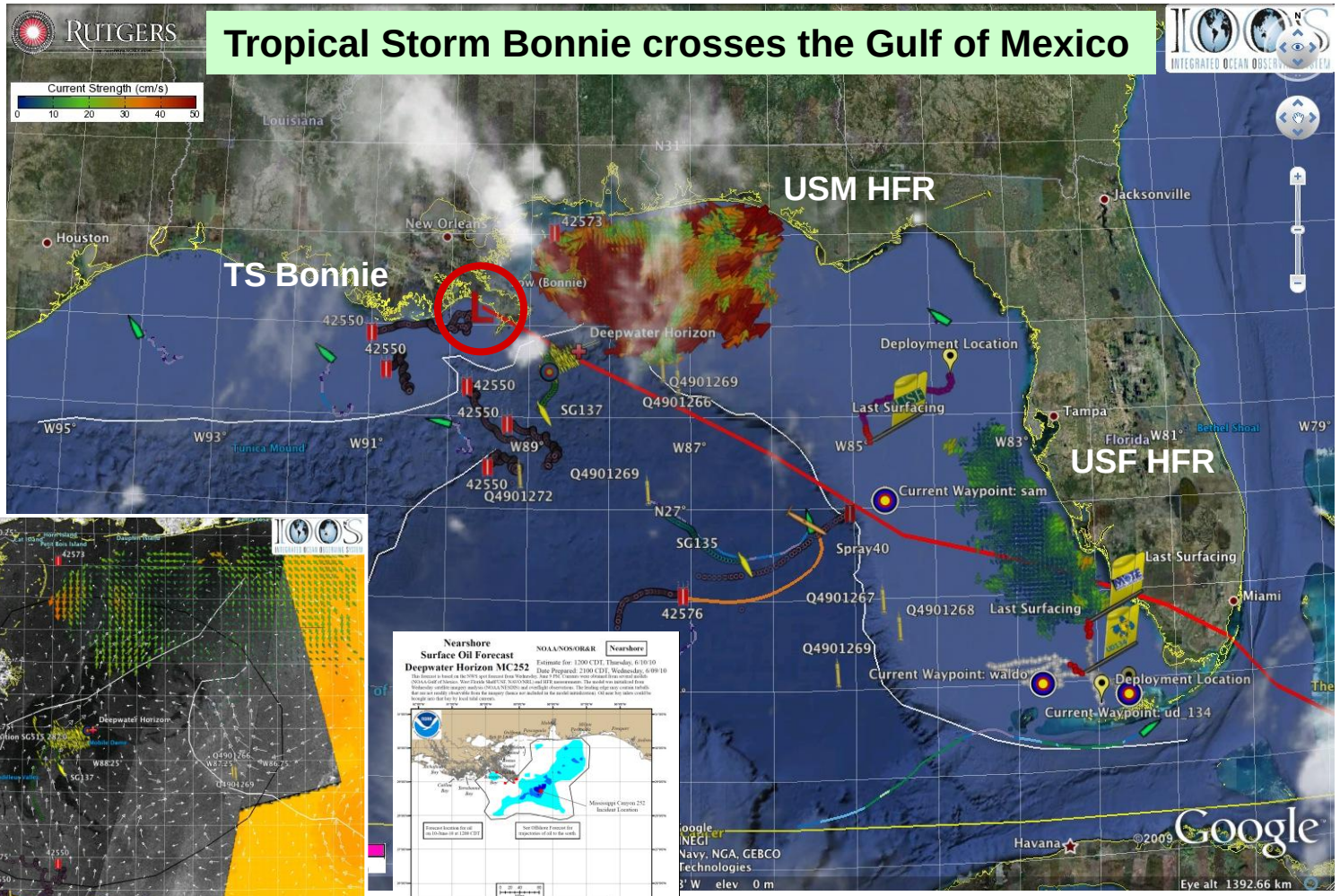
Oil Transport Questions: Will the oil….

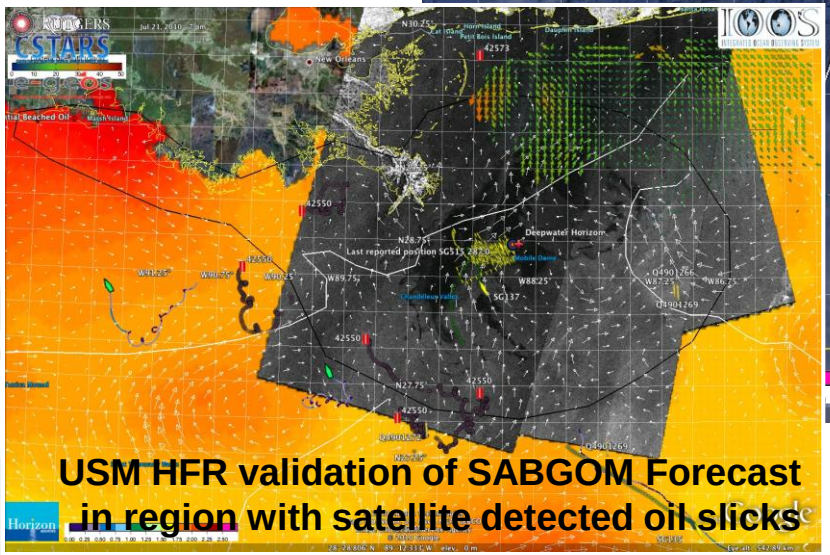
- Come ashore in Louisiana?
- Spread east to Texas or west to Mississippi & Alabama in the wind-driven coastal currents?
- Enter the Loop Current and be transported downstream?
- Hit the Florida Shelf and be driven shoreward by winds?
- Ride the Loop Current south and hit the Florida Keys?
- Be transported out of the Gulf of Mexico by the Gulf Stream and impact the East Coast?
- How much is below the surface?

Deepwater Horizon Oil Spill: Coordinated Rapid Response

Contributed Assets:

HF Radar Networks
USF, USM
Gliders
iRobot, Mote, Rutgers, SIO, UDel, USF, Navy
Drifters & Profilers
Horizon Marine, Navy
Satellite Imagery
CSTARS, UDel
Ocean Forecasts
Navy, NCSU
Data/Web Services
ASA, Rutgers, SIO





USM HFR validation of SABGOM Forecast in region with satellite detected oil slicks

HFR used for Oil Slick Forecasts by NOAA/NOS/OR&R

Deepwater Horizon Glider Data Flow

- Individual glider operators provided, at minimum, Time, Lat & Lng time series.
- Available CTD data forwarded to NOAA National Data Buoy Center.
- Transmitted over the Global Telecommunication System for models.

Rutgers aggregation center
NOAA distribution center

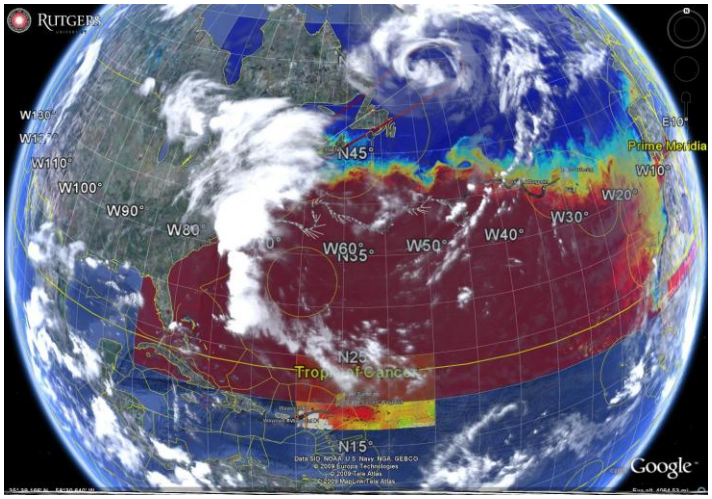
Glider	Owner	Deployed	Tot Days	Tot Dist (km)
RU21	Rutgers	1	35	607
RU23	Rutgers	5	87	1582
UD 134	U of Delaware	3	51	1111.5
Bass	U of South Florida	3	31	552
Waldo	Mote Marine Lab	4	74	1476
Sam	U of South Florida	2	39	677
SG135	NAVOCEANO	1	86	1353
SG137	NAVOCEANO	1	86	970
SG515	iRobot/U of Washington	1	69	1500
Spray0040	SIO	1	106	3000
TOTALS:		**18**	**317**	**6005.5**

Trans-Atlantic Education

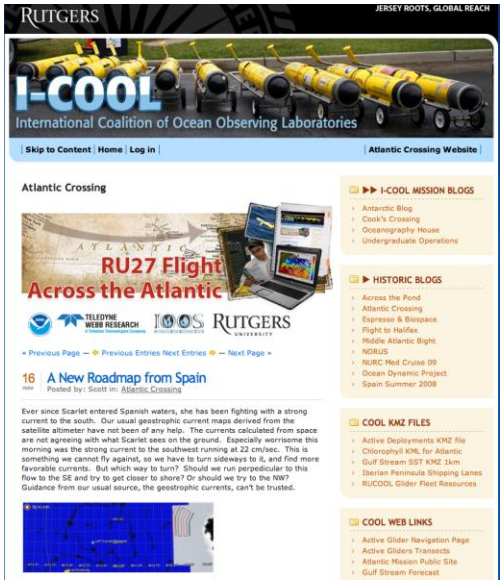
Social networking tools developed to enable collaboration between scientists and students in the U.S., Canada, Spain and Portugal

- PLOCAN
- Universidad de Las Palmas de Gran Canaria

Web Portal



Google Earth
Interactive Interface



Briefing Blog

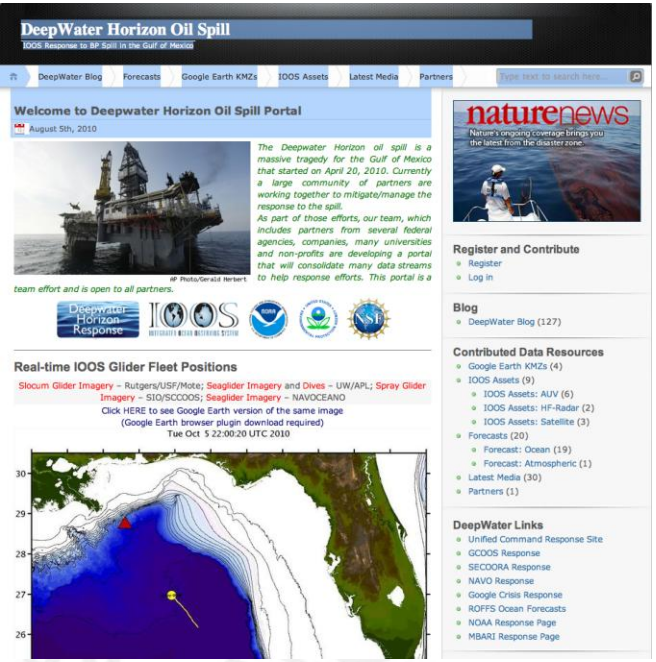
Deepwater Horizon Information Flow

Tools developed for education during the trans-Atlantic mission of RU27 adapted to coordinate response to the oil spill:

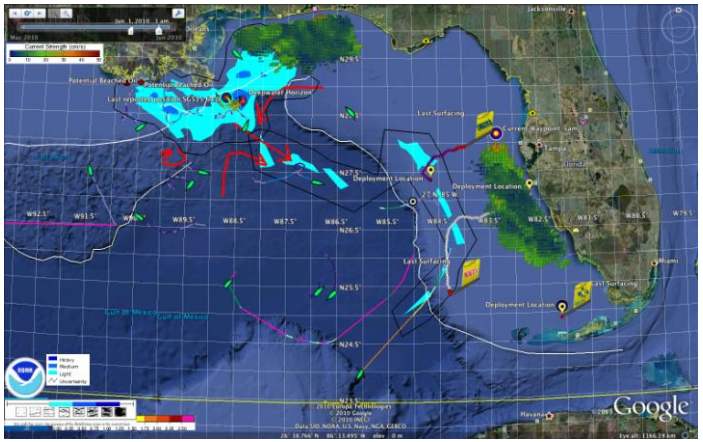
1)Collaborative web portal established as an aggregation center for information

2)Google Earth data/model interactive interface used for environmental analysis & glider path planning

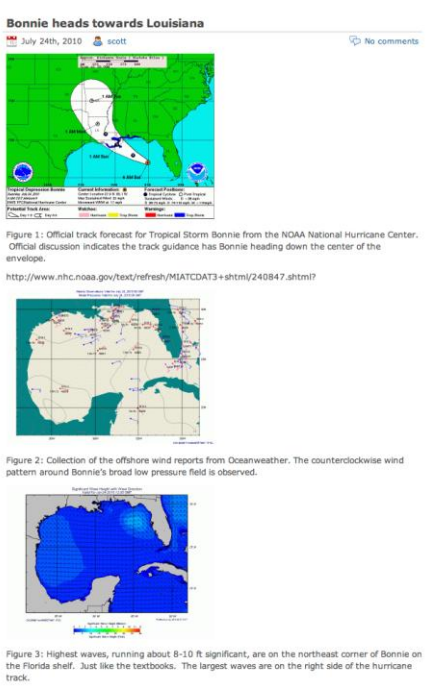
3)Blog established to share analyses and provide comments – 127 briefs posted



Web Portal

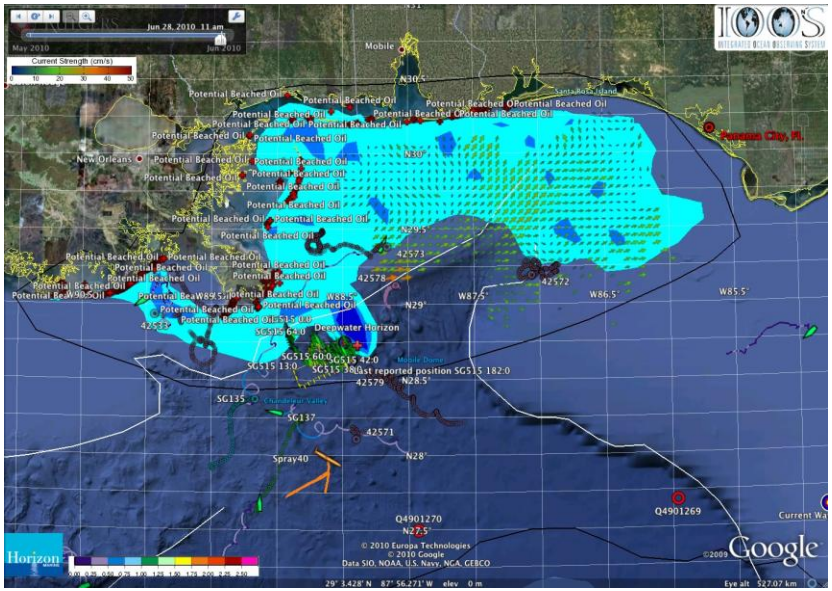


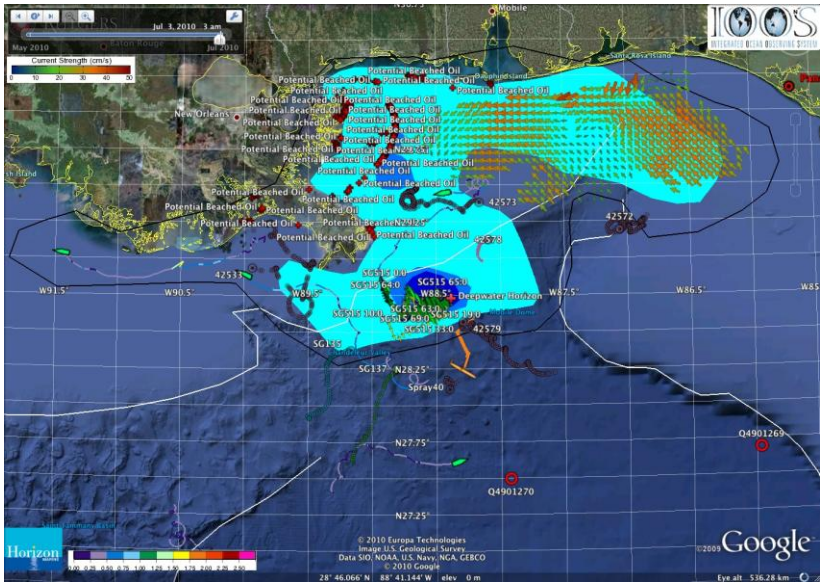
Google Earth
Interactive Interface

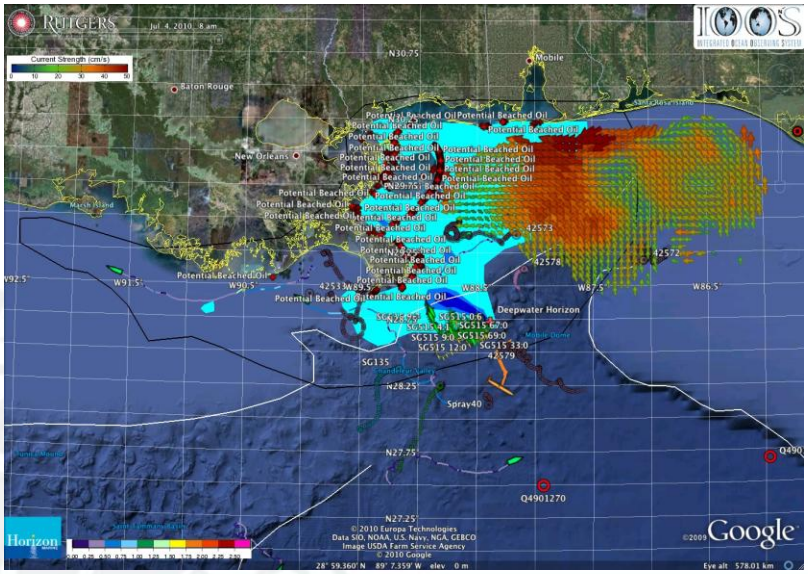


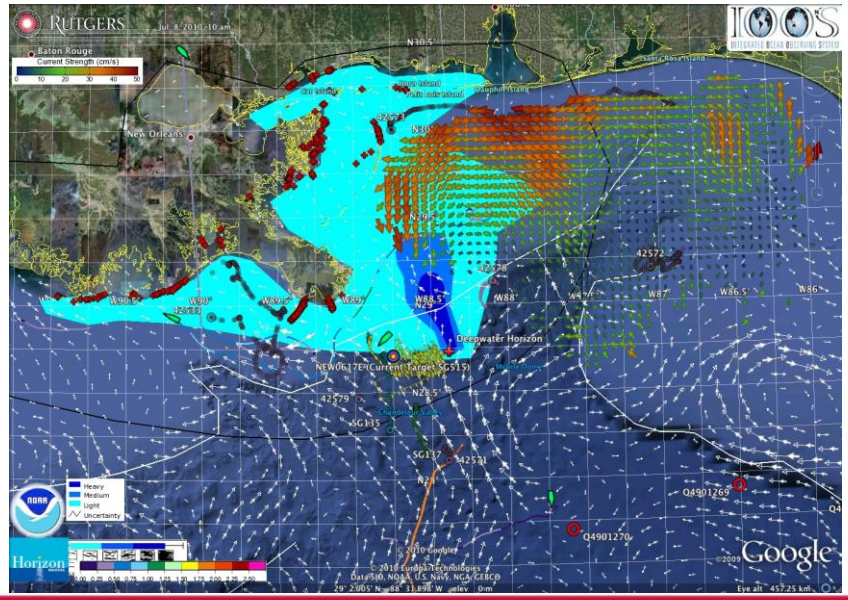
Briefing Blog

Deepwater Horizon Oil Spill Response: Near Field Environmental Analyses

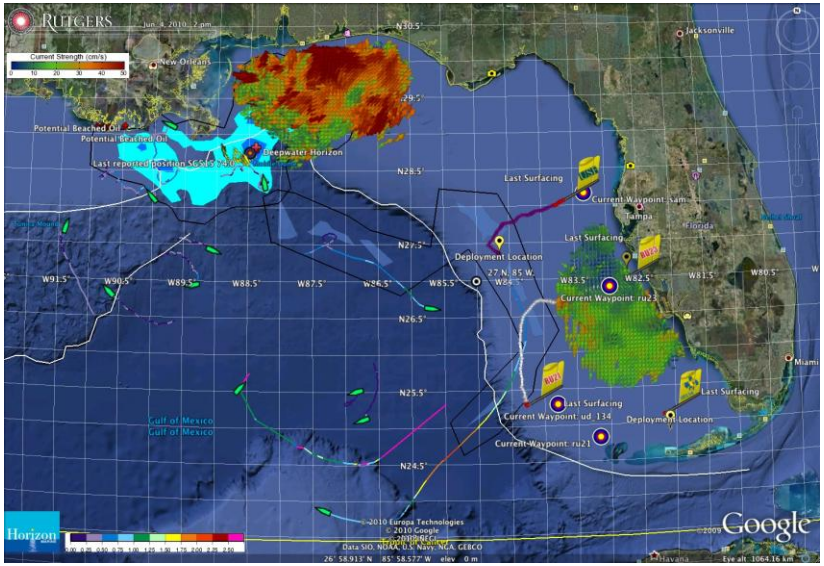


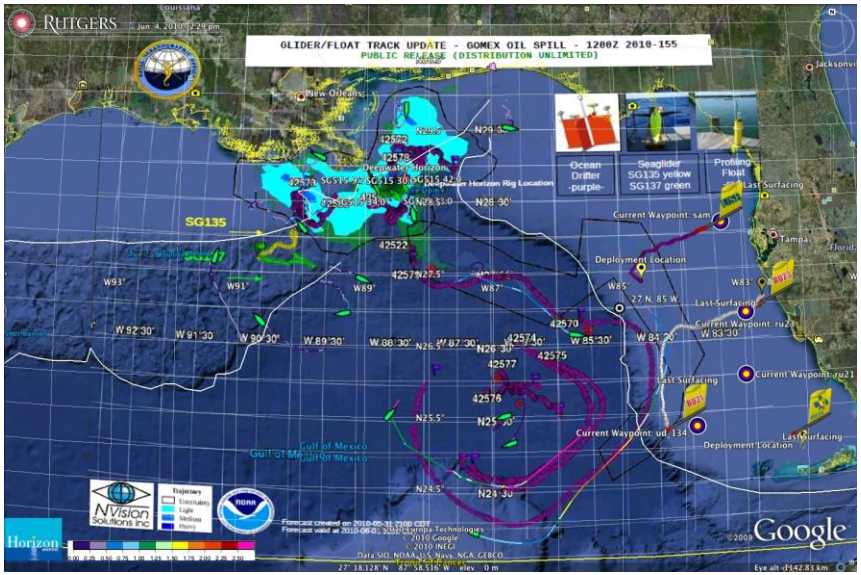


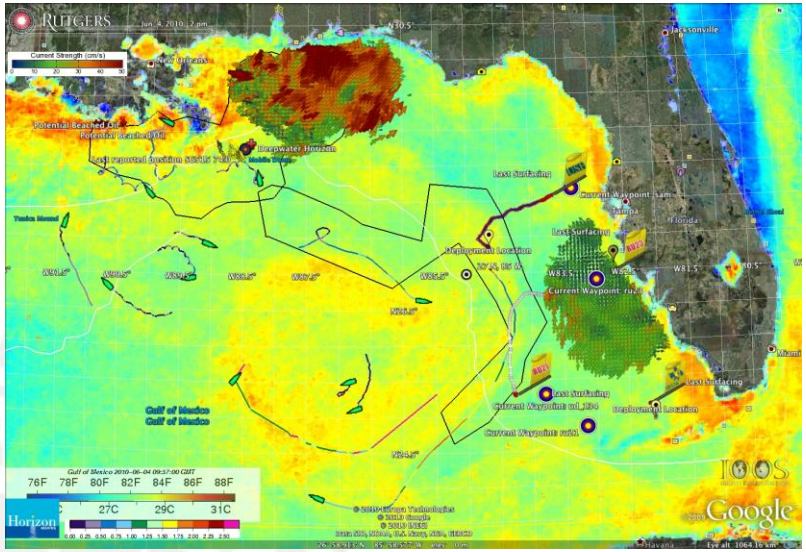


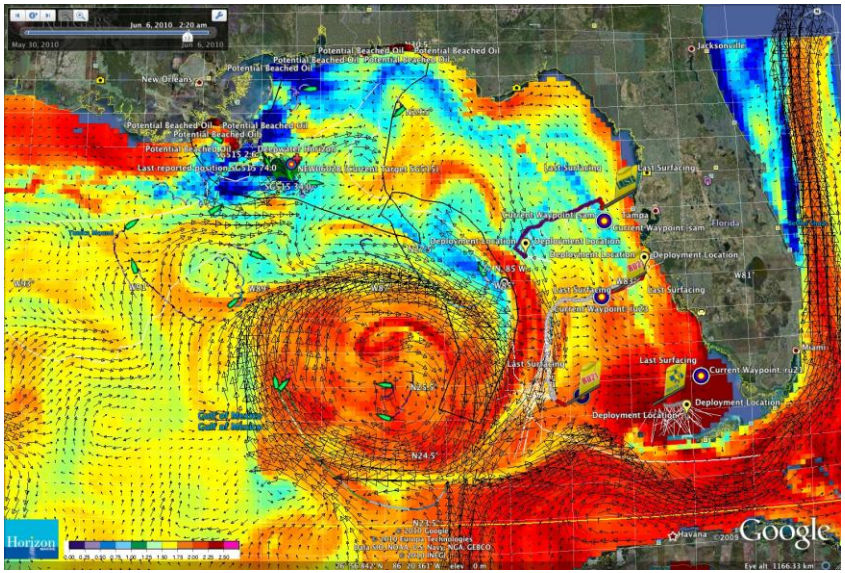


Deepwater Horizon Oil Spill Response: Far Field Environmental Analyses

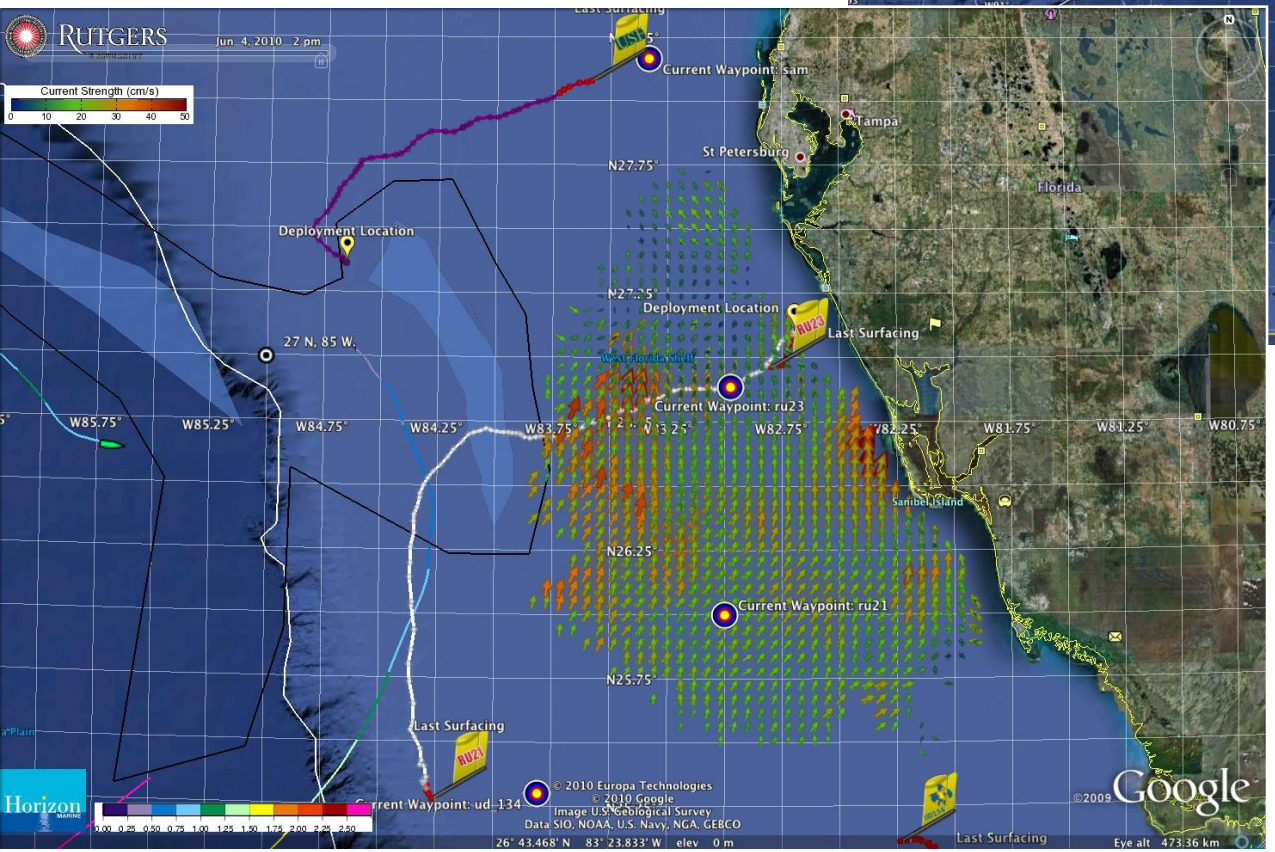


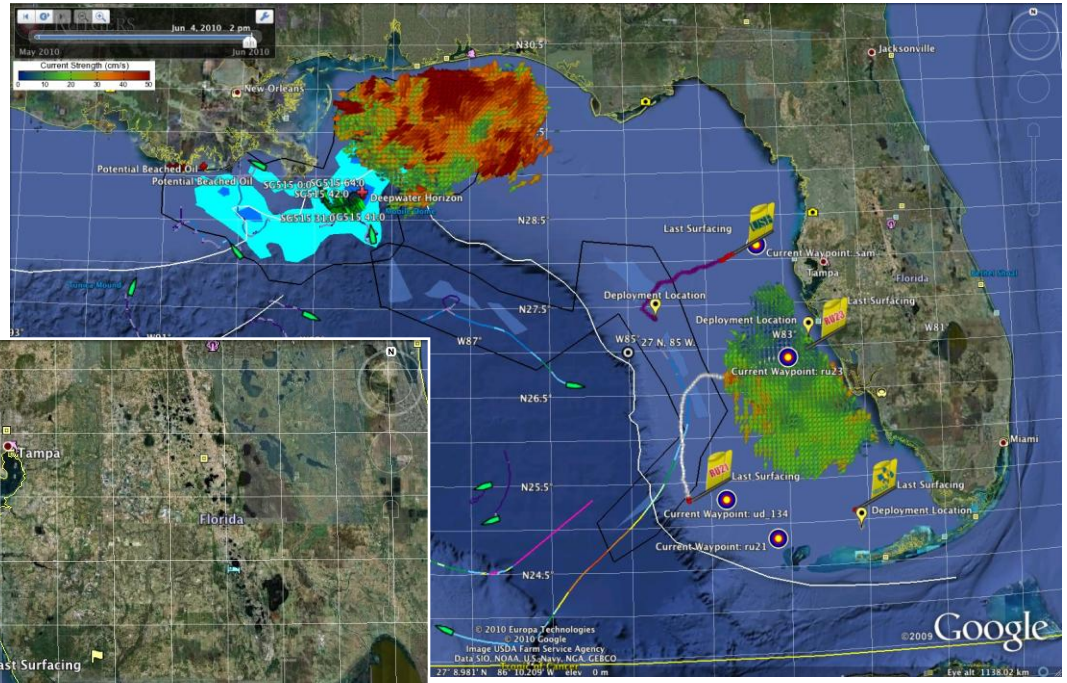




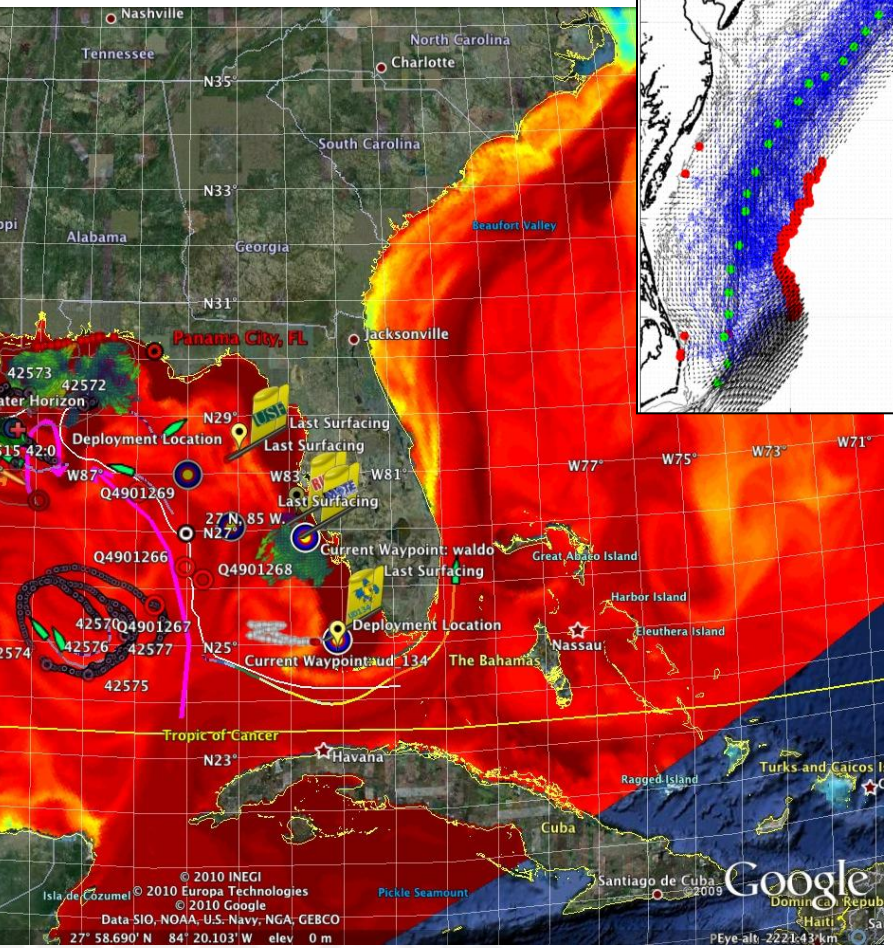


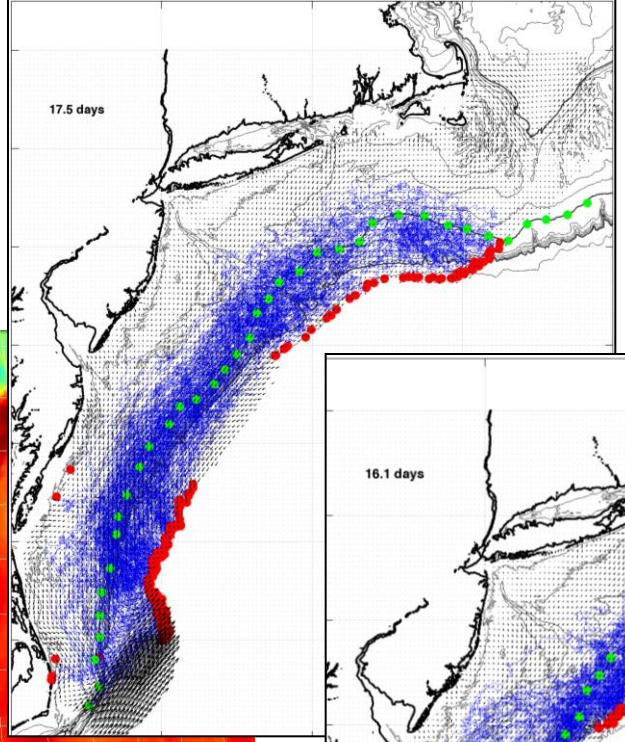
Deepwater Horizon Oil Spill Response: Approach to West Florida Shelf



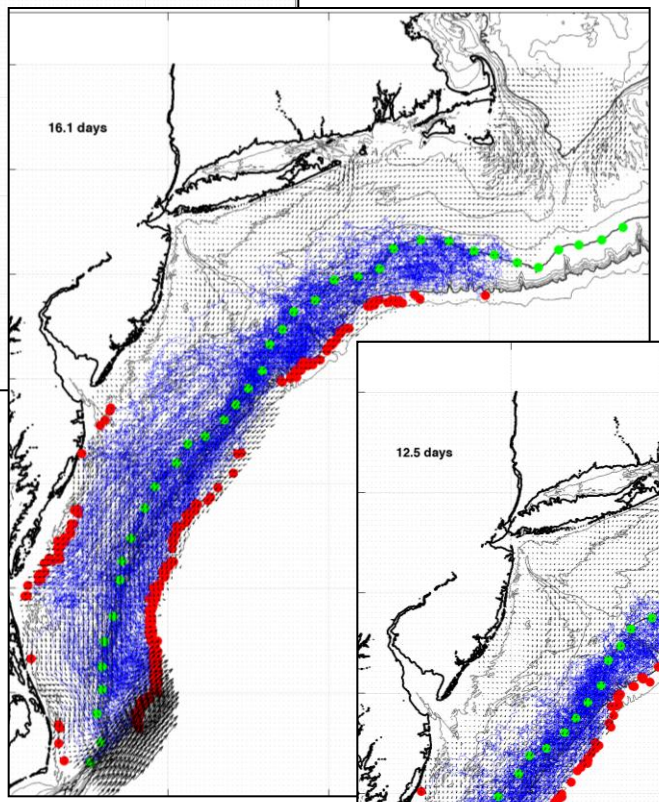


Deepwater Horizon Response: East Coast Impacts

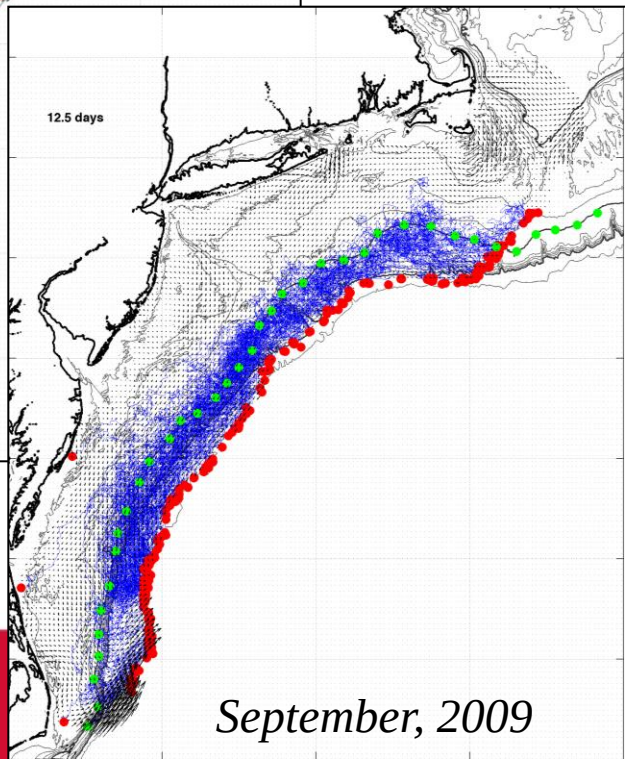




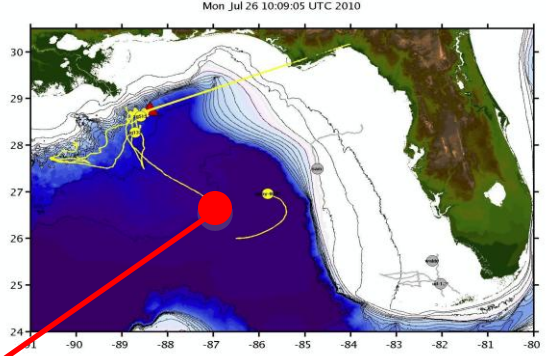
July, 2009



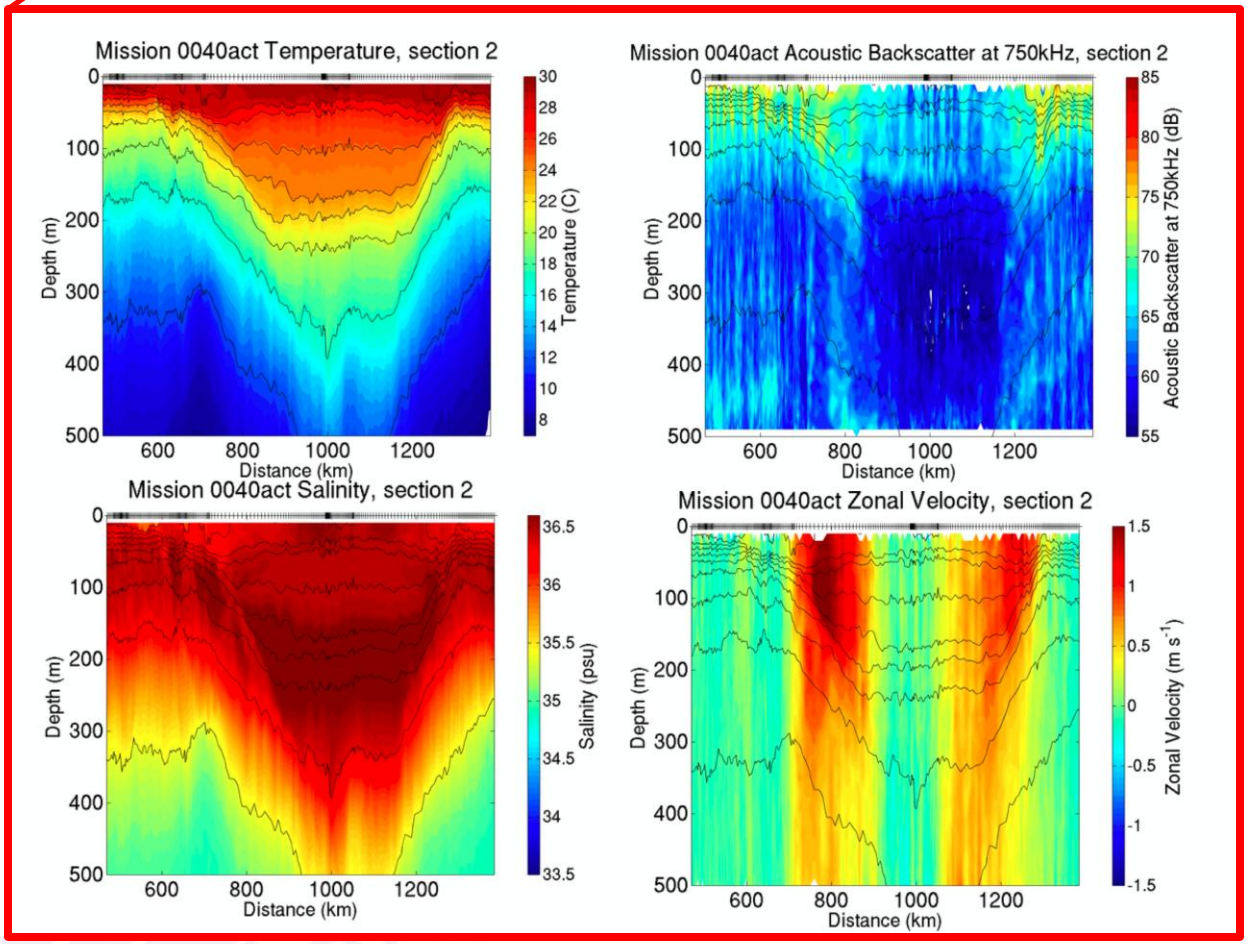
August, 2009



September, 2009

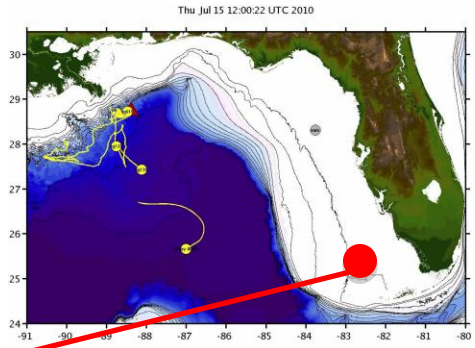


OFFSHORE VARIABILITY AND BEHAVIOR IN ANIMALS DURING DEEP WATER HORIZON



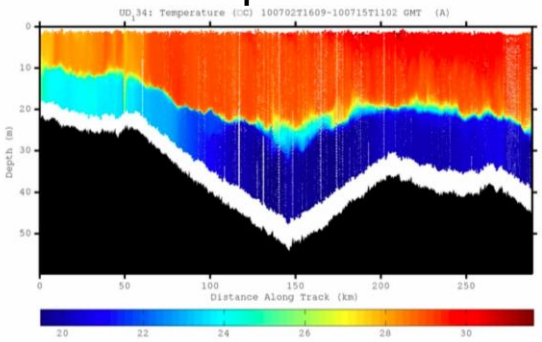
Scripps Spray story offshore

- cross offshore eddy
- acoustic backscatter showed diel migration of Organisms
- critters concentrated at the high zonal currents at the eddy edge

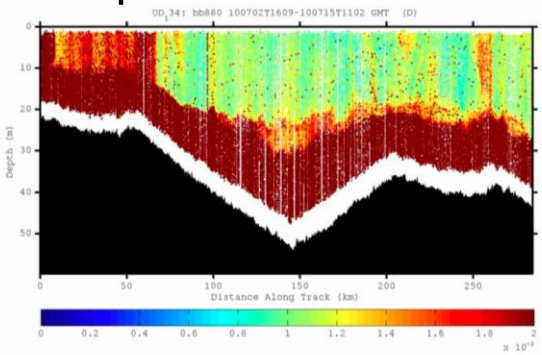


Nearshore waters off Florida show a great deal of subsurface optical complexity not visualized with satellites

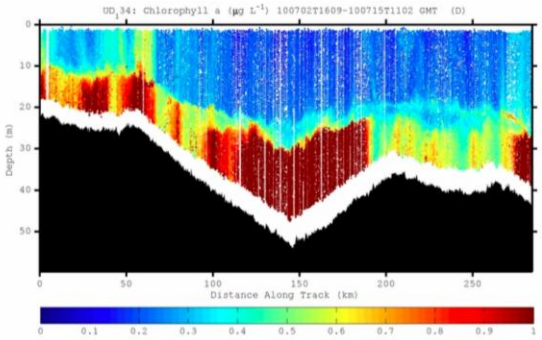
Temperature



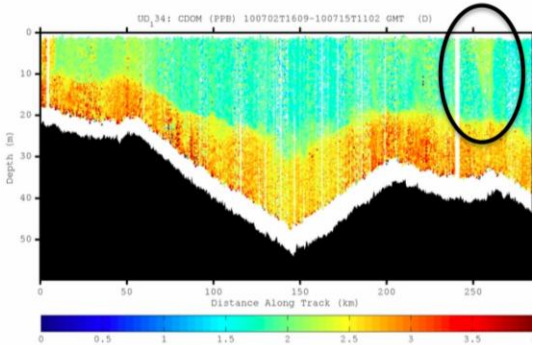
Optical Backscatter



Chlorophyll fluorescence



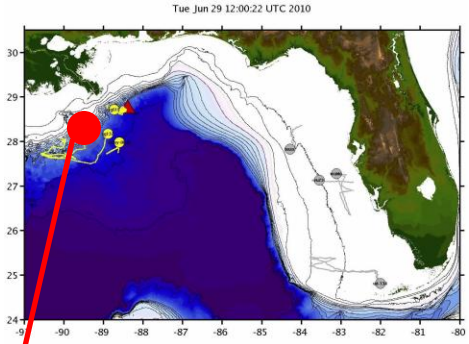
CDOM fluorescence



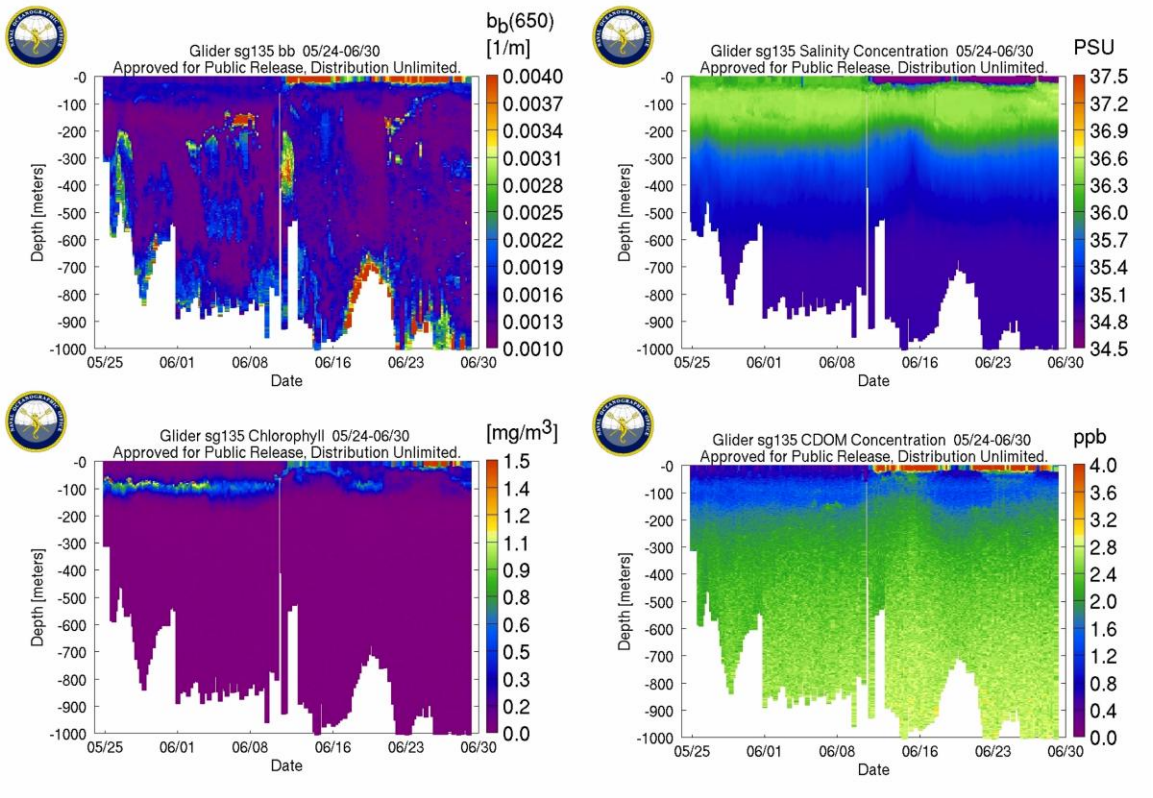
U. Delaware Webb story inshore

- Strongly stratified w/high sediment resuspension during storms
- CDOM offshore consistent with oil offshore

☹ Phytoplankton more patchy then sediment

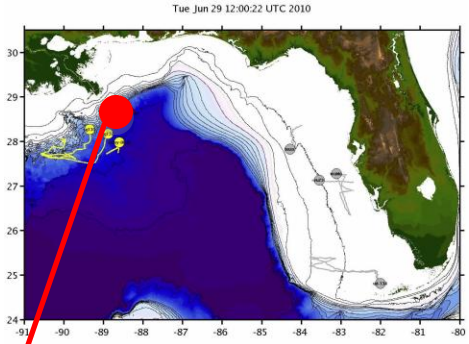


Waters offshore the west coast of Louisiana discoveries by NAVO seagliders

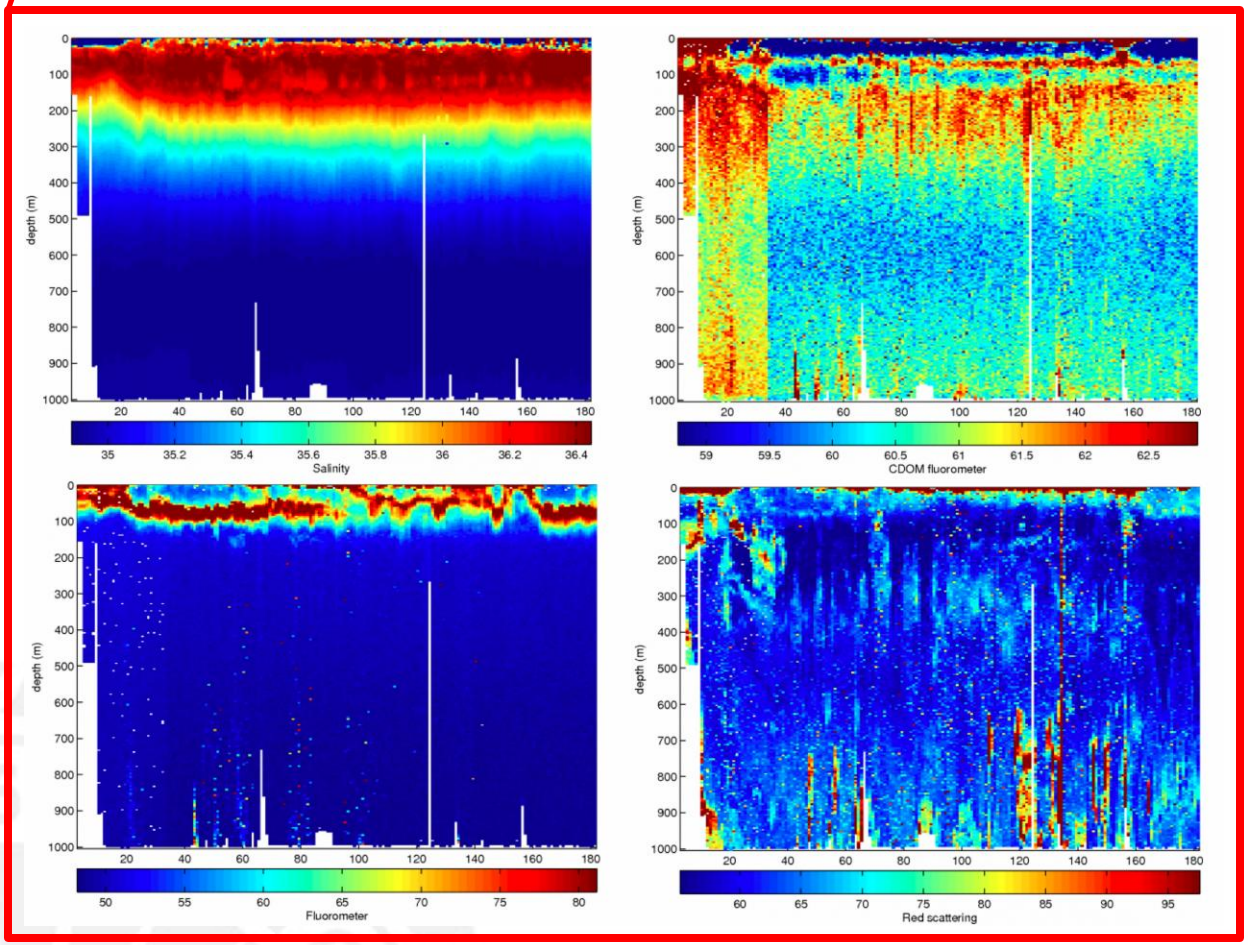


NAVO stories off Louisiana

- Presence of Mississippi visible in surface waters in CDOM
- Optical signals at depth are unexplained but real. We do not what they are.
- Optical signals at depth are not phytoplankton



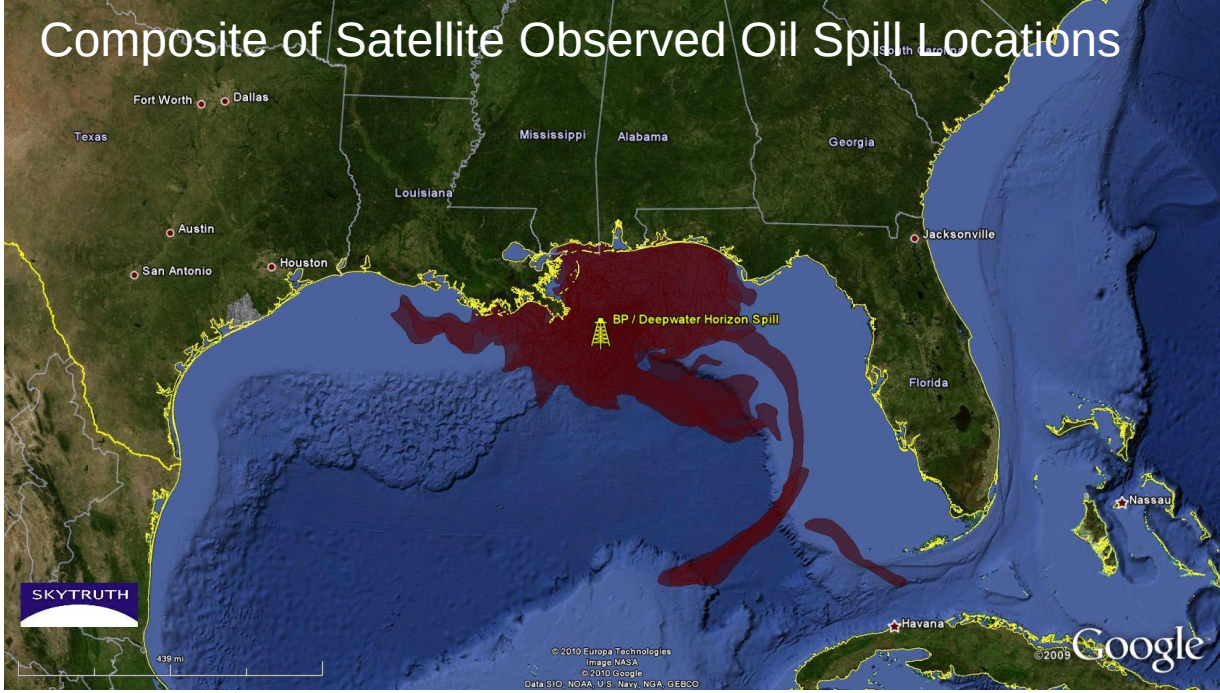
Waters offshore the oil spill region mapped by iRobot sea-gliders



iRobot stories off Deep Water

- CDOM at mid-depth consistent with oil plume
- Great deal of subsurface variability in CDOM not correlated with phytoplankton or particles
- Optical signals at depth are not phytoplankton

Feedback from the Deepwater Horizon Unified Command Center



"All - Greetings from Unified Area Command in New Orleans. I couldn't agree more - the IOOS community has acquitted itself very well during this entire incident. Not only has everyone provided valuable information - you have done it without getting in the way of the ongoing operations. It's been a pleasure to represent IOOS here and see all the great contributions from the larger IOOS community. "

- Sam Walker (IOOS representative to Deepwater Horizon Unified Command Center), June 18, 2010

"… AWESOME JOB - that call that we had last week was a very good thing. You are taking a huge burden off of the team here who is trying to simply capture the deluge of assets now being deployed. "

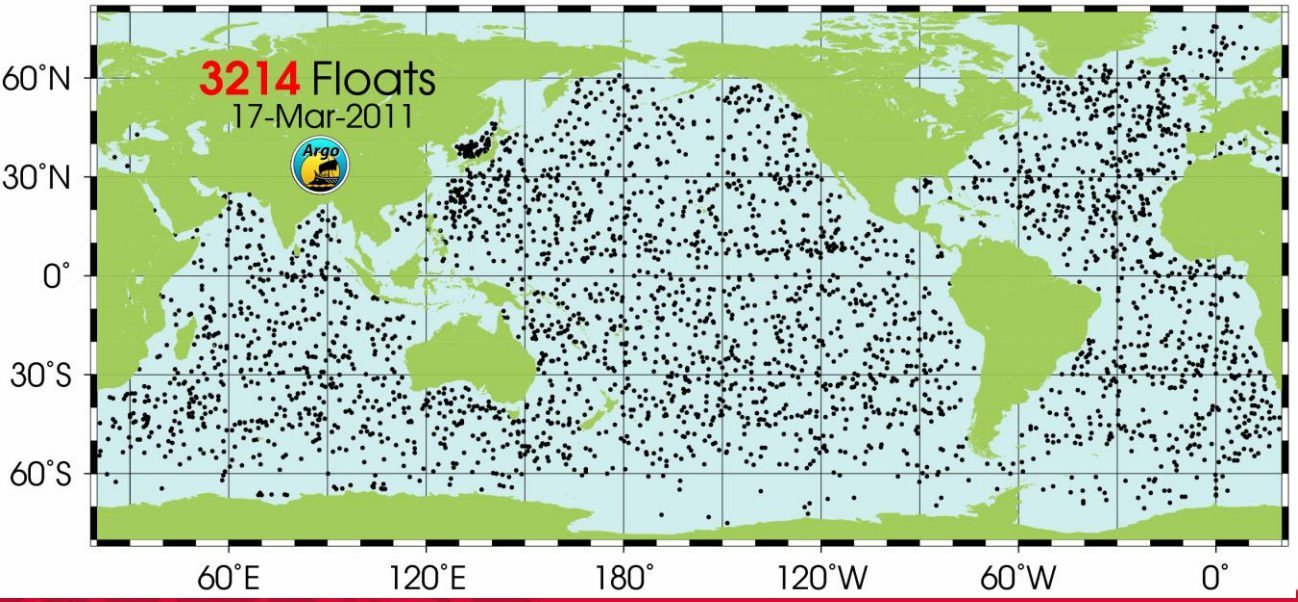
- Sam Walker (IOOS representative to Deepwater Horizon Unified Command Center), July 2, 2010

"…Thanks to everyone for all of your efforts to support the Response and the very professional and competent manner in which you have executed your efforts. IOOS has played a huge role in informing the modeling teams and the Unified Command through your extraordinary service. "

- Sam Walker (IOOS representative to Deepwater Horizon Unified Command Center), August 6, 2010

Response to the IOOS Success in the Gulf of Mexico

1) Funding for the U.S. National HF Radar network in the Presidents Budget.
2) Discussions for a U.S. National Glider Network invigorated.
3) Discussions to make both Global starting.

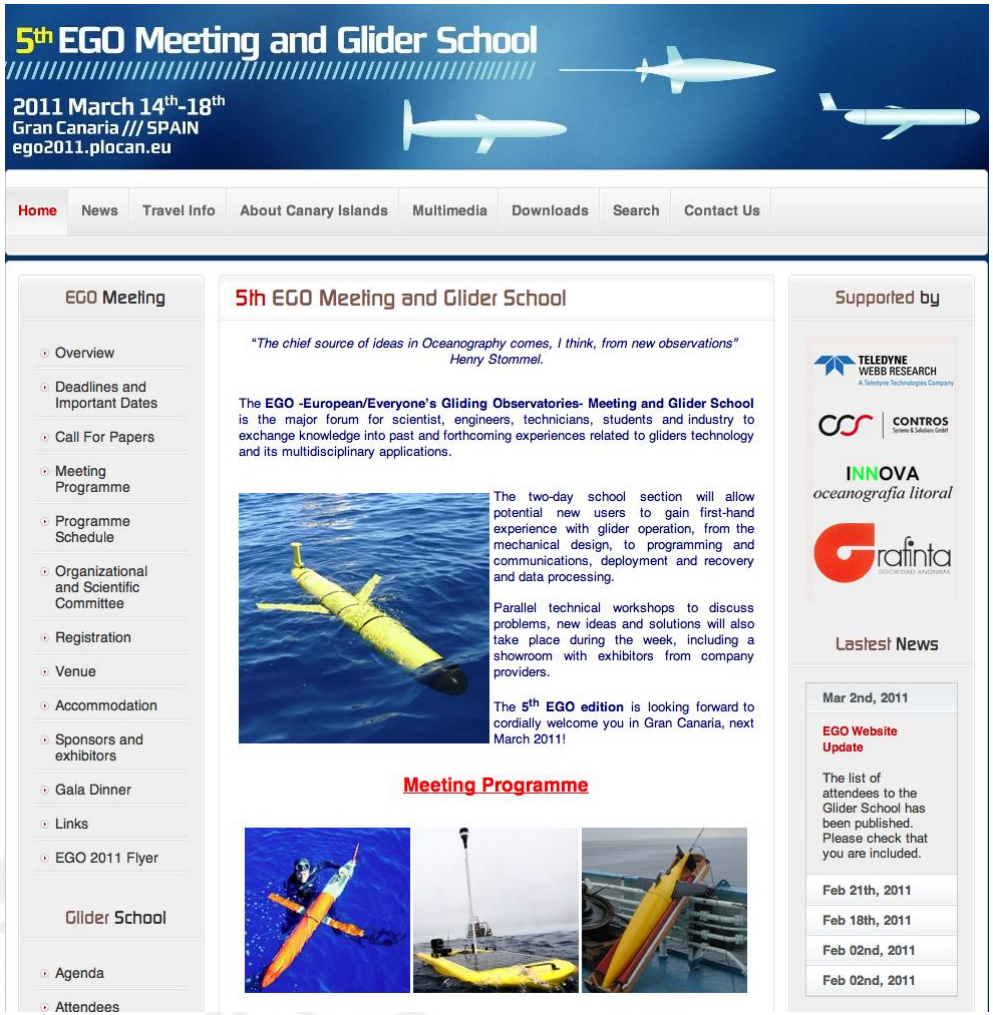


Global Glider Display

Minimum: Time, Lat, Lng

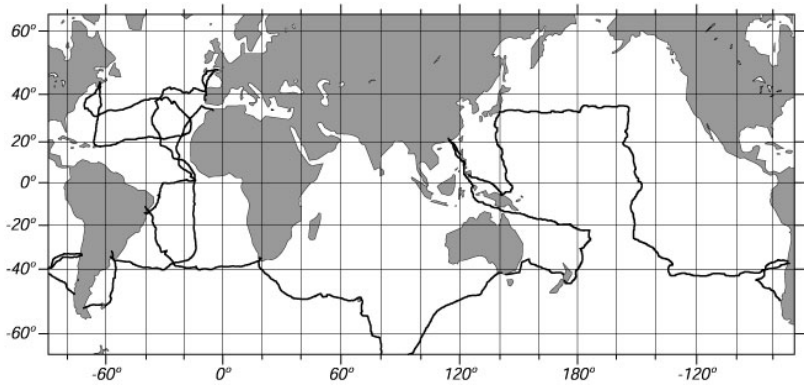
Options for data sharing:
1 – Send datasets to redundant aggregation centers.
2 – Serve up JavaScript Object Notation (JSON) for Google Maps.
3 – Post datasets on local webservers/fileservers with guest account access.

Conclusions

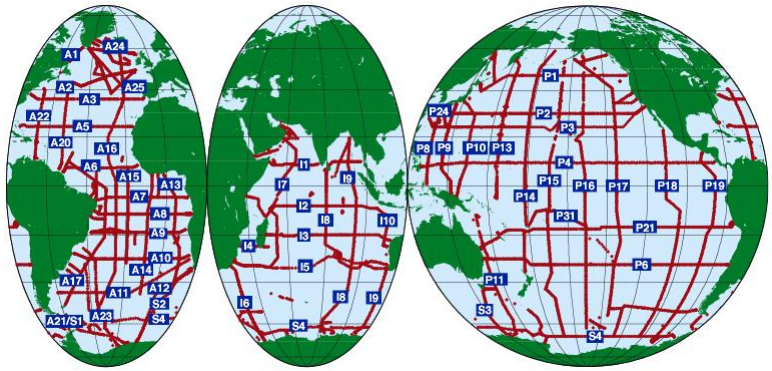


Transitions:

1) **EGO to GGO**
2) **Technology to Science & Society**
3) **Research to Education**



HMS Challenger Voyage



World Ocean Circulation Experiment