

North Carolina Vulnerability to the Deepwater Horizon Oil Spill



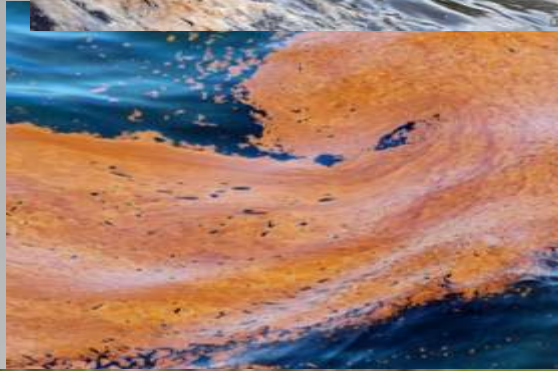
Rick Luettich
Institute of Marine Sciences

July 29, 2010



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

Will it Come Here?



A Few Numbers

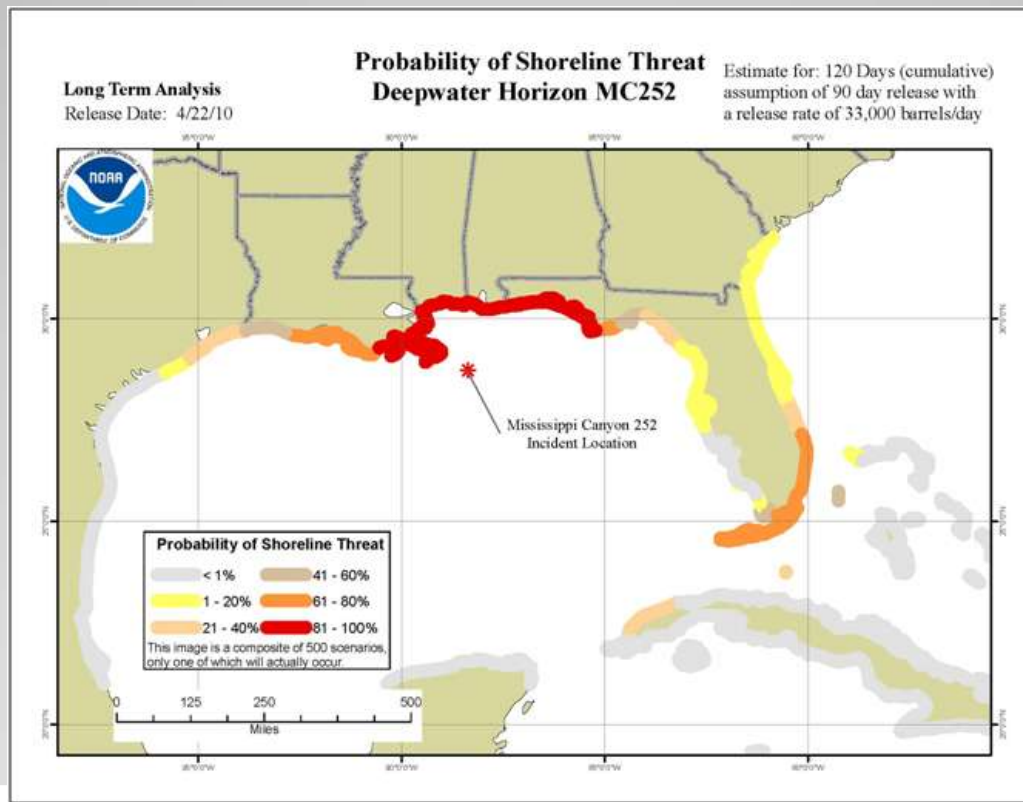
- Oil released from April 22 – July 16 (87 days)
- 35,000 – 65,000 barrels of oil released/day
= 4 million barrels (175 million gal) total
- 3.7 million gal/yr from natural seeps in GoM
- 250,000 – 750,000 barrel spill - Exxon Valdez
- 175 million gallons = 265 Olympic swimming pools (25m x 50m x 2m)
- ~ 400,000 gallons dispersant used

Model Results from the National Center for Atmospheric Research June 3, 2010

Disclaimer

" The results presented here are intended for research guidance only. They are not a forecast of where the oil will go, but a scenario of what might happen if the loop current is in a typical configuration. "

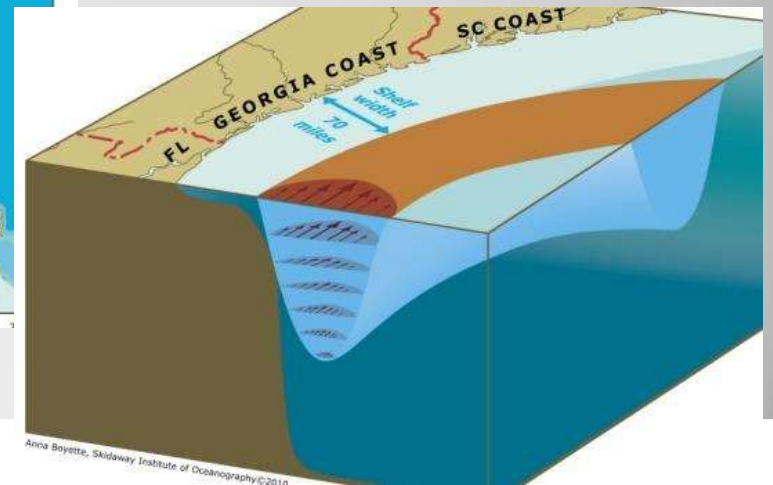
Probability of Shoreline Threat NOAA Model Projections July 2, 2010



Loop Current - The Connection between Gulf of Mexico and US East Coast



- 500-800 m deep
- Speed 1-2 mph
= Louisiana to Miami in ~1 week



For Near Surface Oil to Directly Impact Coastal NC

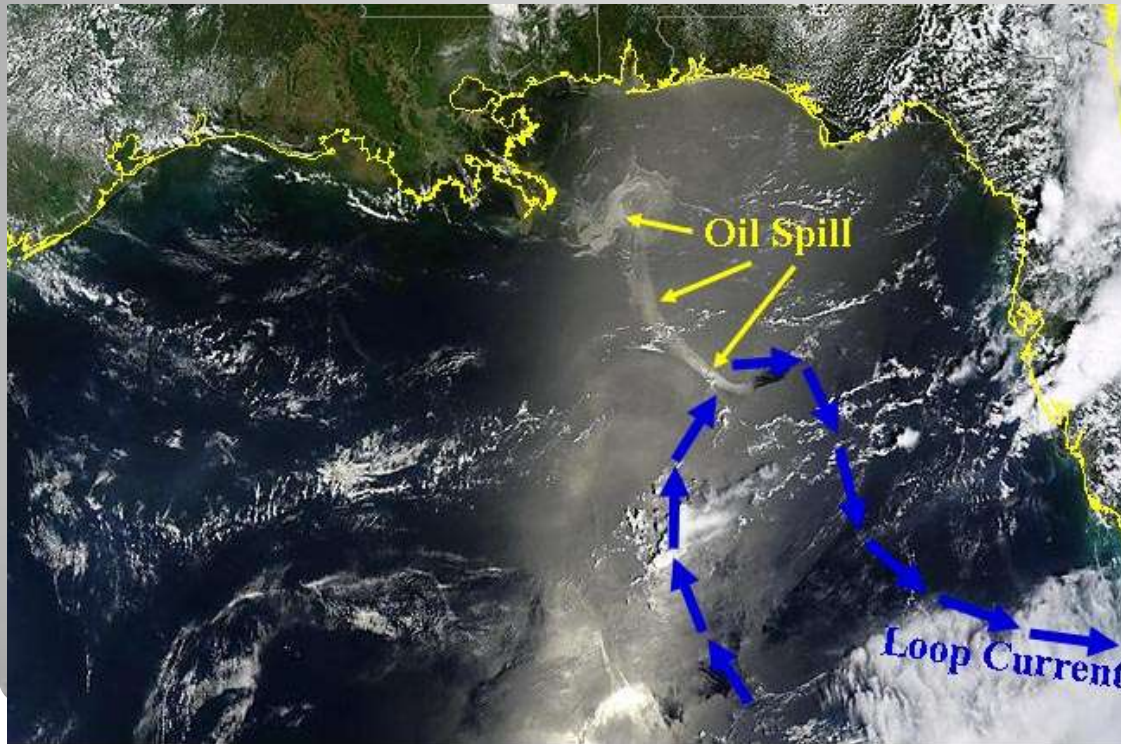
Phase 1 – Get from the Deepwater Horizon well location into the Gulf of Mexico Loop Current

Phase 2 – Get from the Loop Current into the Florida Current and into the Gulf Stream

Phase 3 – Get from the Gulf Stream to NC coastal/near shore/estuarine waters

Phase 1 – Horizon Well to Loop Current

Surface oil movement away from the well depends mainly on winds and coastal currents



NASA MODIS
Satellite image on
May 17, 2010 -
surface slick has
entered into the
Loop Current

Subsurface
plume ~1200 m
deep, beneath
Loop Current

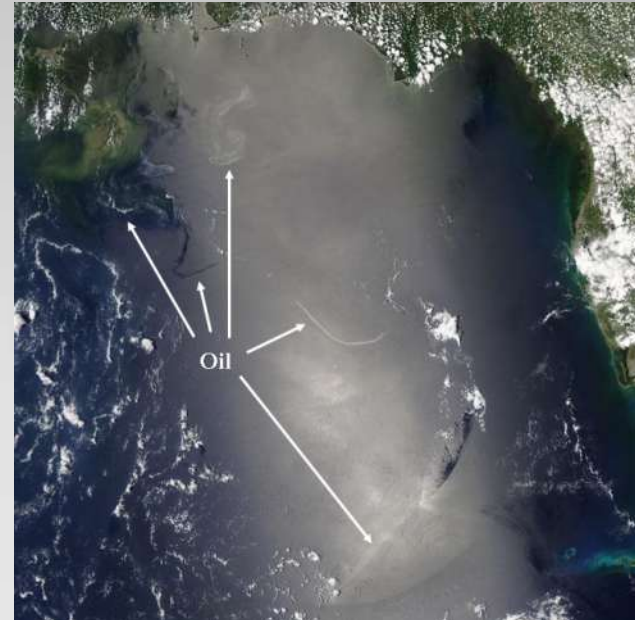
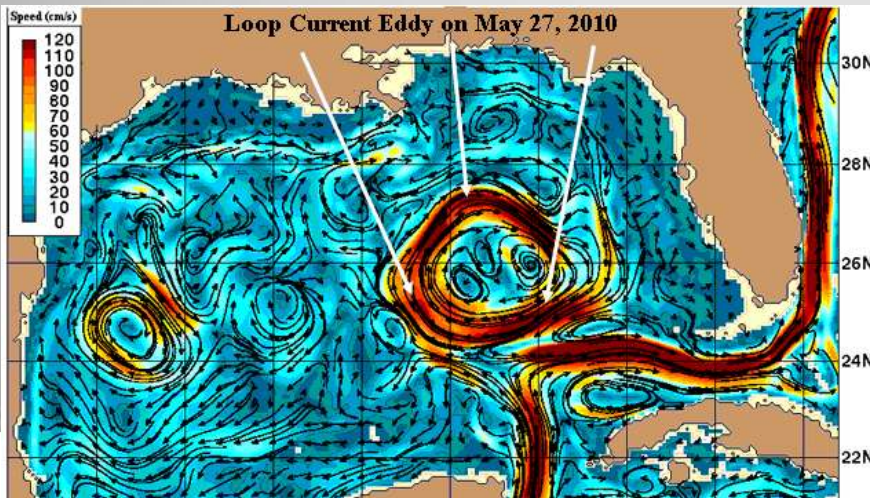
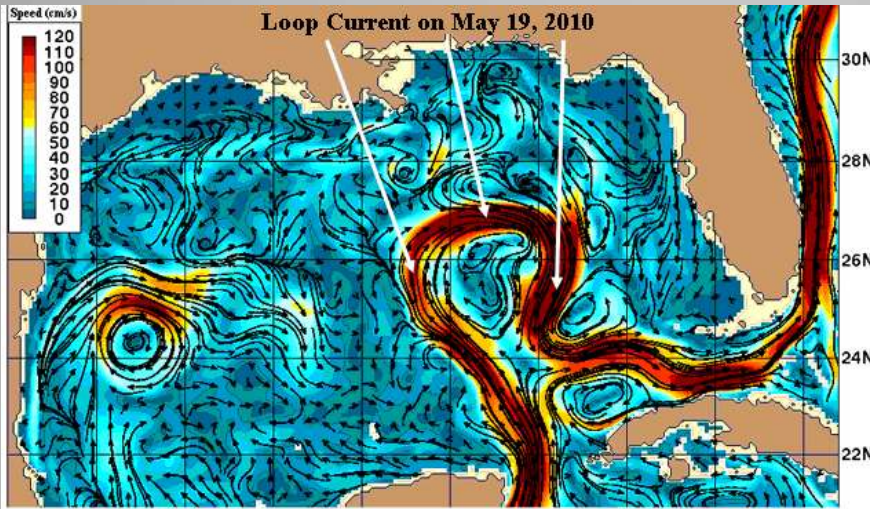
Phase 2 – Loop Current to Gulf Stream



Loop Current

- Every 6-18 months an eddy breaks off – last eddy July 2009

Phase 2 – Loop Current to Gulf Stream



NASA MODIS Satellite image on May 27, 2010 indicates surface slick moving around Loop Current “Eddy Franklin”

Phase 2 – Loop Current to Gulf Stream

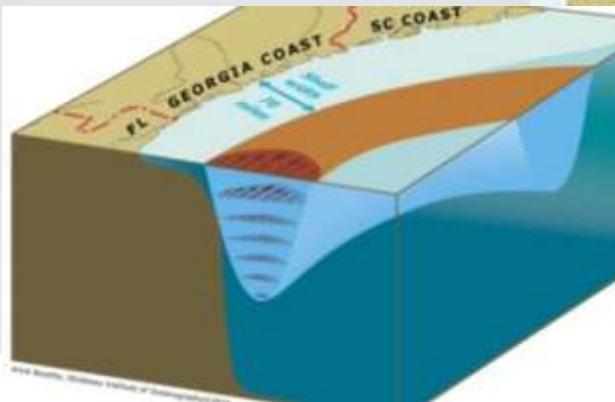
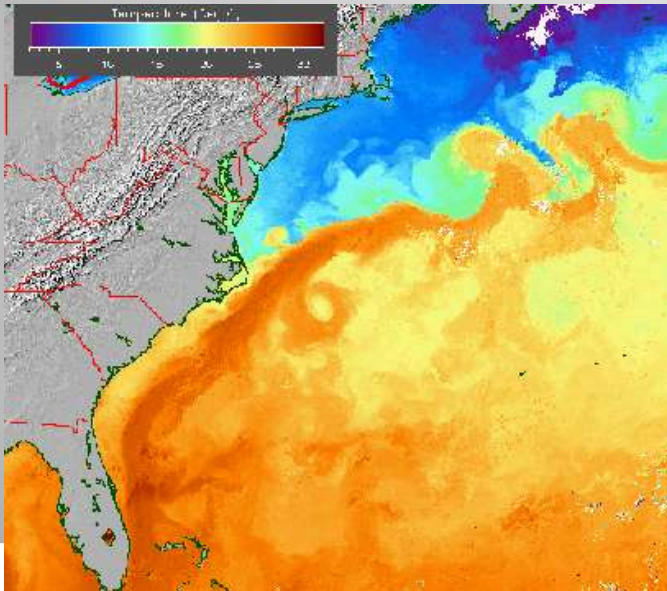
Connection between Gulf of Mexico and US East Coast *largely broken* for past 2 months!



Phase 3 – Gulf Stream to NC Coast

1,000 m deep (surface to bottom),
deeper than continental shelf

Moves 4-5 mph center, 1-2 mph edges
= 2 weeks from Miami to Cape Hatteras
~20 – 100 miles from NC coastline



Phase 3 –Gulf Stream to NC Coast

Coastline where Gulf Stream is nearer shore is more vulnerable

SE Florida & Cape Hatteras

Gulf Stream Filaments & Eddies

Break off surface water & up well lower water
Fall 1987 Red Tide in NC (~2 months from FL)

Onshore blowing winds

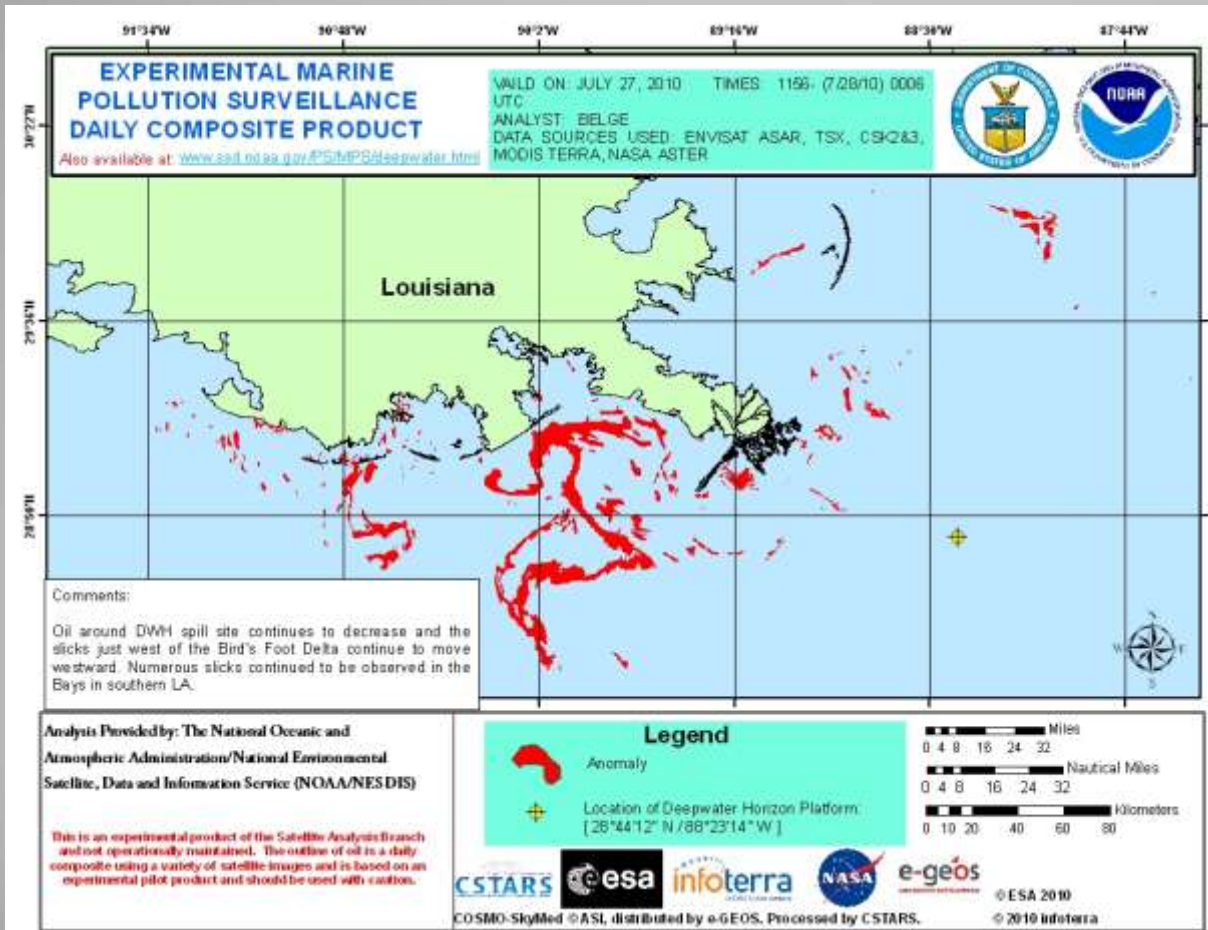
Can blow in floating sargassum (seaweed) and surface oil?

Winds blowing toward the Southwest

Bring in surface water

Net onshore flow near Cape Hatteras fall-spring

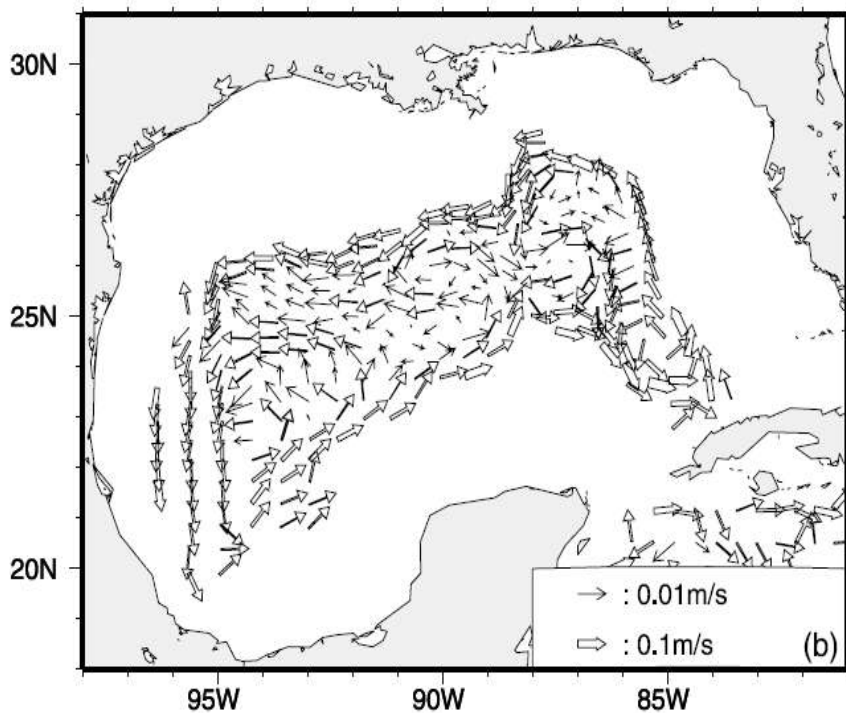
Current Surface Oil Maps



Surface oil is dispersing

Primarily near MS River Delta

What about Subsurface Oil?



Deep circulation $\sim 1,300$ m

10-40% of oil subsurface

Within ~ 50 km of well drops below 1 PPM

$\sim 1,200$ m depth and likely to stay on this density surface
- little mixing

Below depth of FL straights

May exit into Caribbean?

Cold, dark, little degradation?

Outlook for NC

Loop Current

Eddy Franklin should slowly move to west

August/September before Loop Current near the well location again

Most of surface oil gone by then

Oil in Loop Current would take ~1-2 months to reach NC - fall

State of Oil

Much of surface oil is dispersing

Highly degraded

Tar balls, patchy goo

Hurricane Impacts

In Gulf, scatter oil, move to west & into marshes, possibly to Loop Current.

In NC, unlikely to have any effect

If it Comes Here

Most likely tar balls or patches of weathered oil - direct effects probably a nuisance

Indirect effects, e.g., on migratory species such as Bluefin Tuna could be more significant

