Using Ocean Observing Systems & Real Time Data to monitor and clean up Oil Spills

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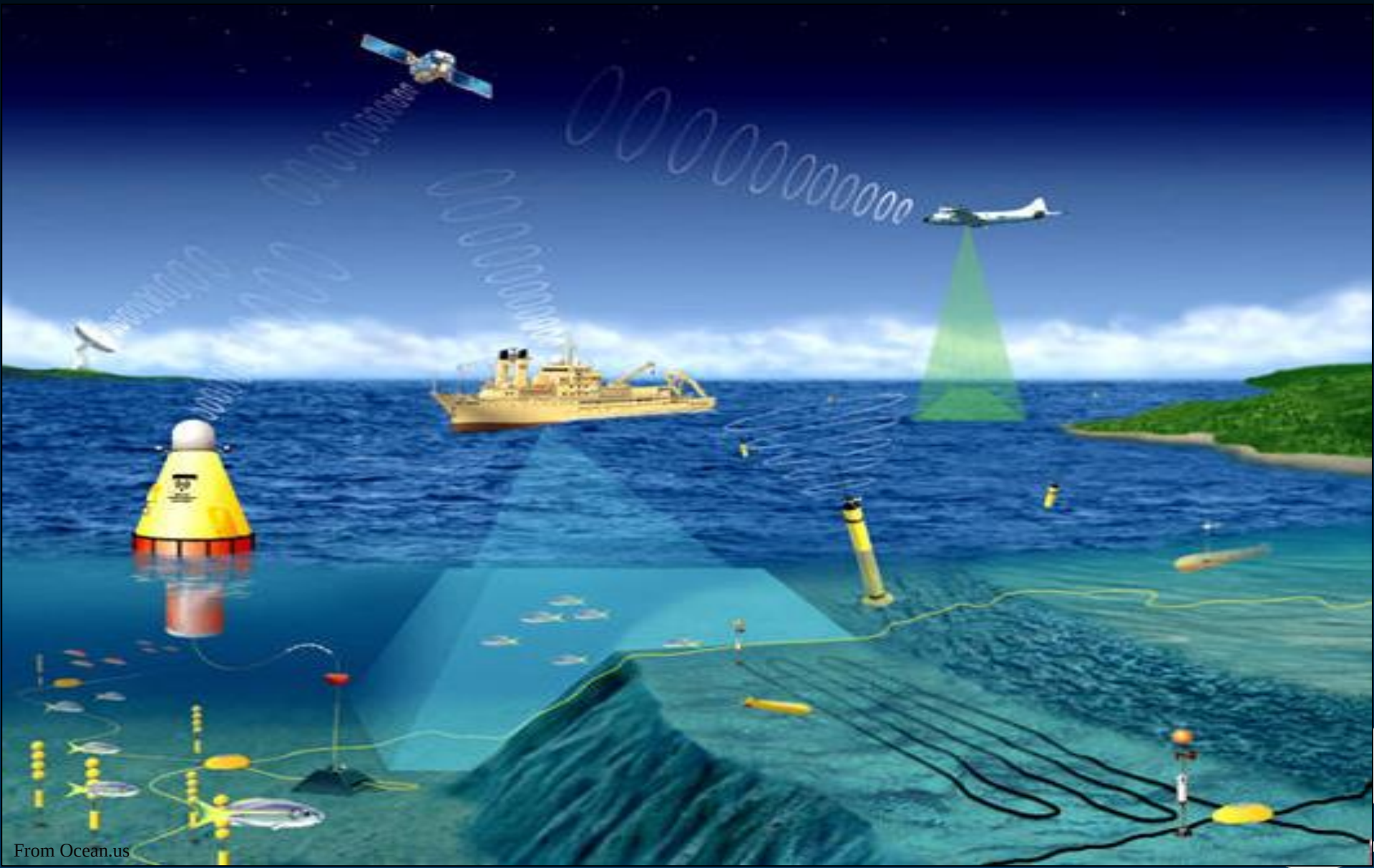
Ocean Observing Systems

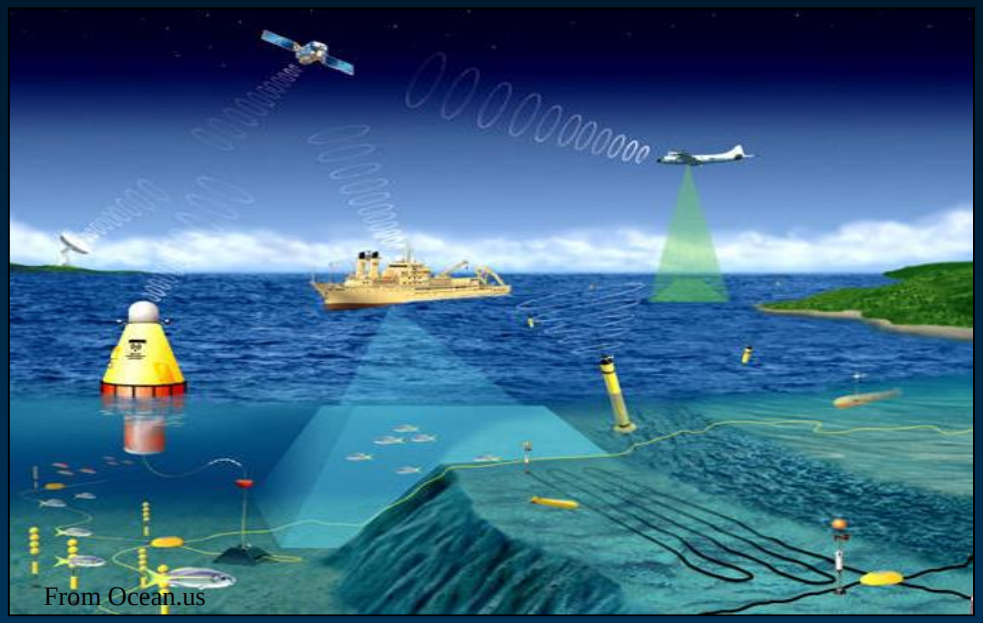


From Ocean.us

Ocean Observing Systems

As a system, the components provide:

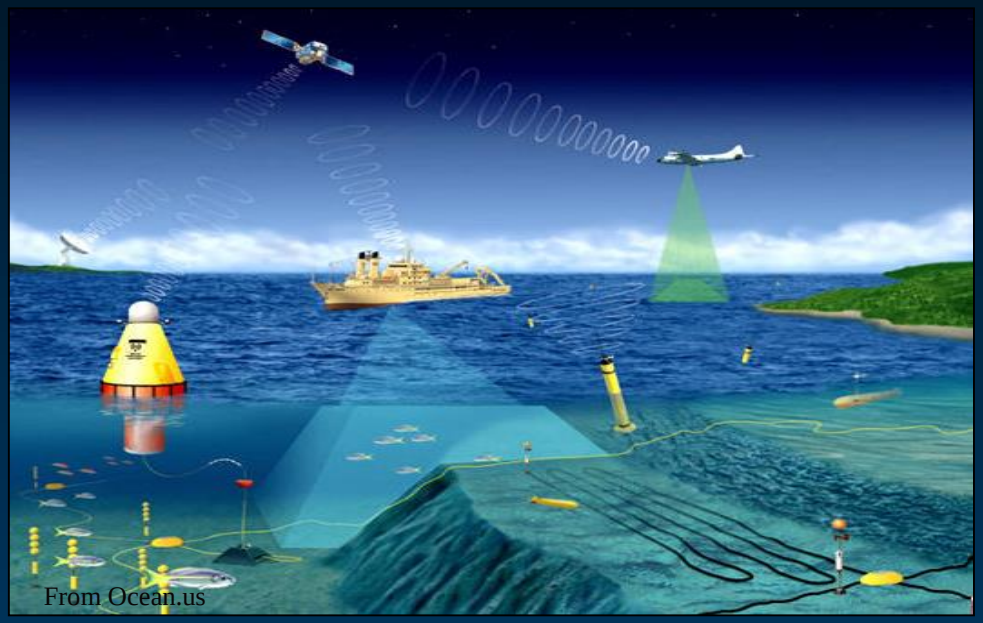
1. Continuous data sets
2. High quality, accurate data through concurrent measurement by many components
3. Means of collecting data without immediate human presence
4. Means of collected valuable data during dangerous conditions like storm events (*see #3*)



Ocean Observing Systems

Continuous data sets are important because they:

1. Show the entire big picture, not just small pieces of information here and there
2. Provide large amounts of quality data to input into forecast models



So not only do scientists use ocean observing system data to see where spilled oil is now, but also to forecast where it is going!

The Components

Remotely Operated Vehicles

Some of the first images we saw after the Deepwater Horizon incident were from Remotely Operated Vehicles, or ROVs

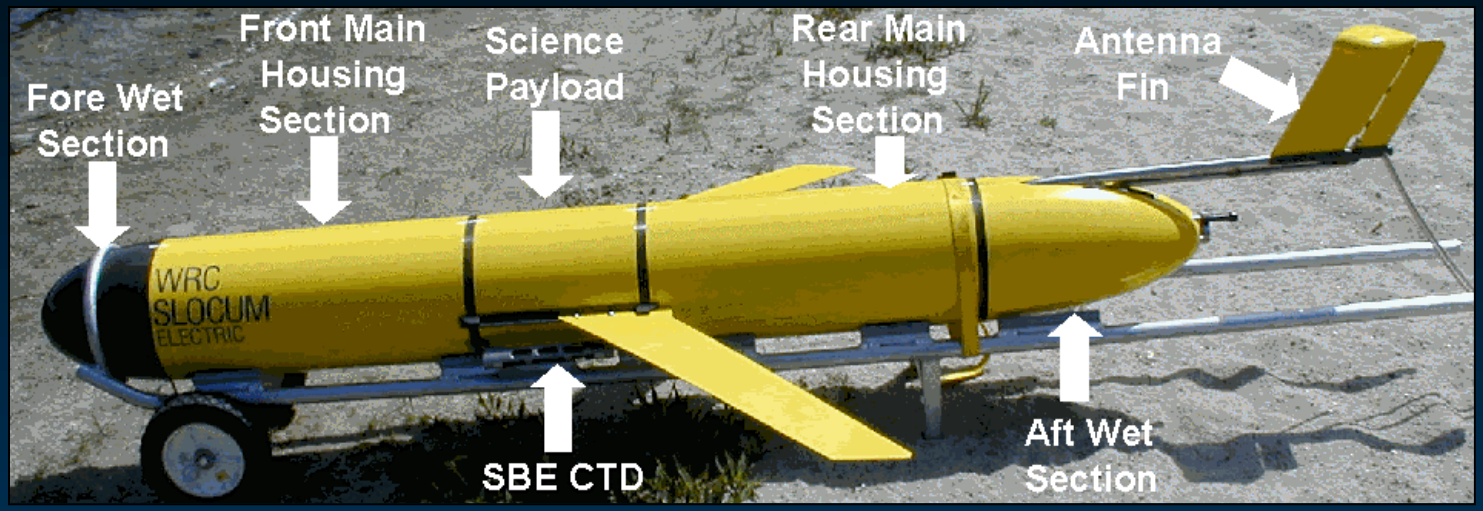
*Note the ROV's claw in the center of the picture

Remotely Operated Vehicles

From NOAA

Autonomous Underwater Vehicles (AUVs)

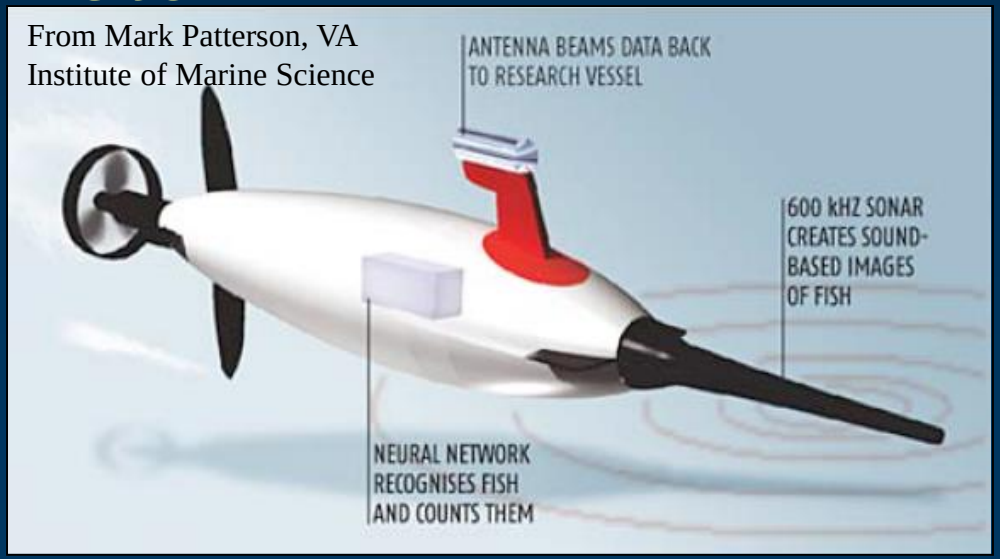
Gliders



From Rutgers Coastal Ocean Observation Lab (COOL)

Fetch

From Mark Patterson, VA Institute of Marine Science



REMUS

From Office of Naval Research

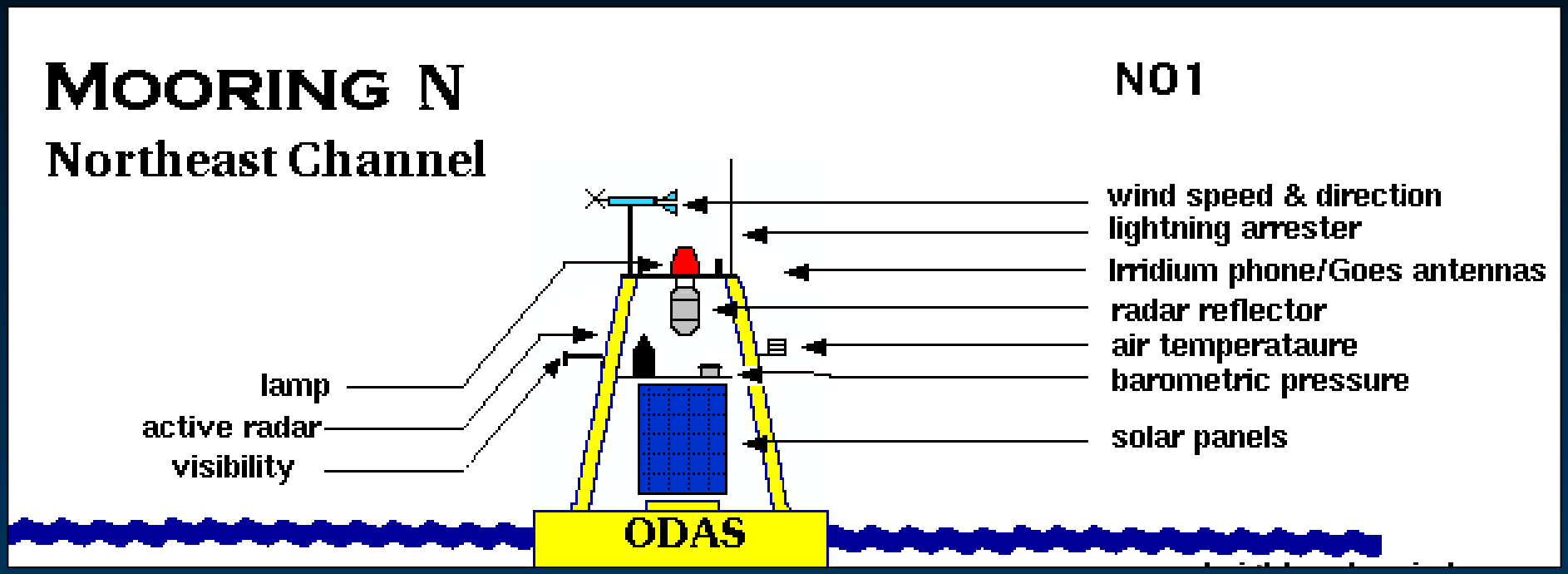
Buoys

Equipped with sensors that can measure:

- Air & water temperature
- Wind speed & direction
- Water current speed & direction
- Wave height & period
- Atmospheric pressure

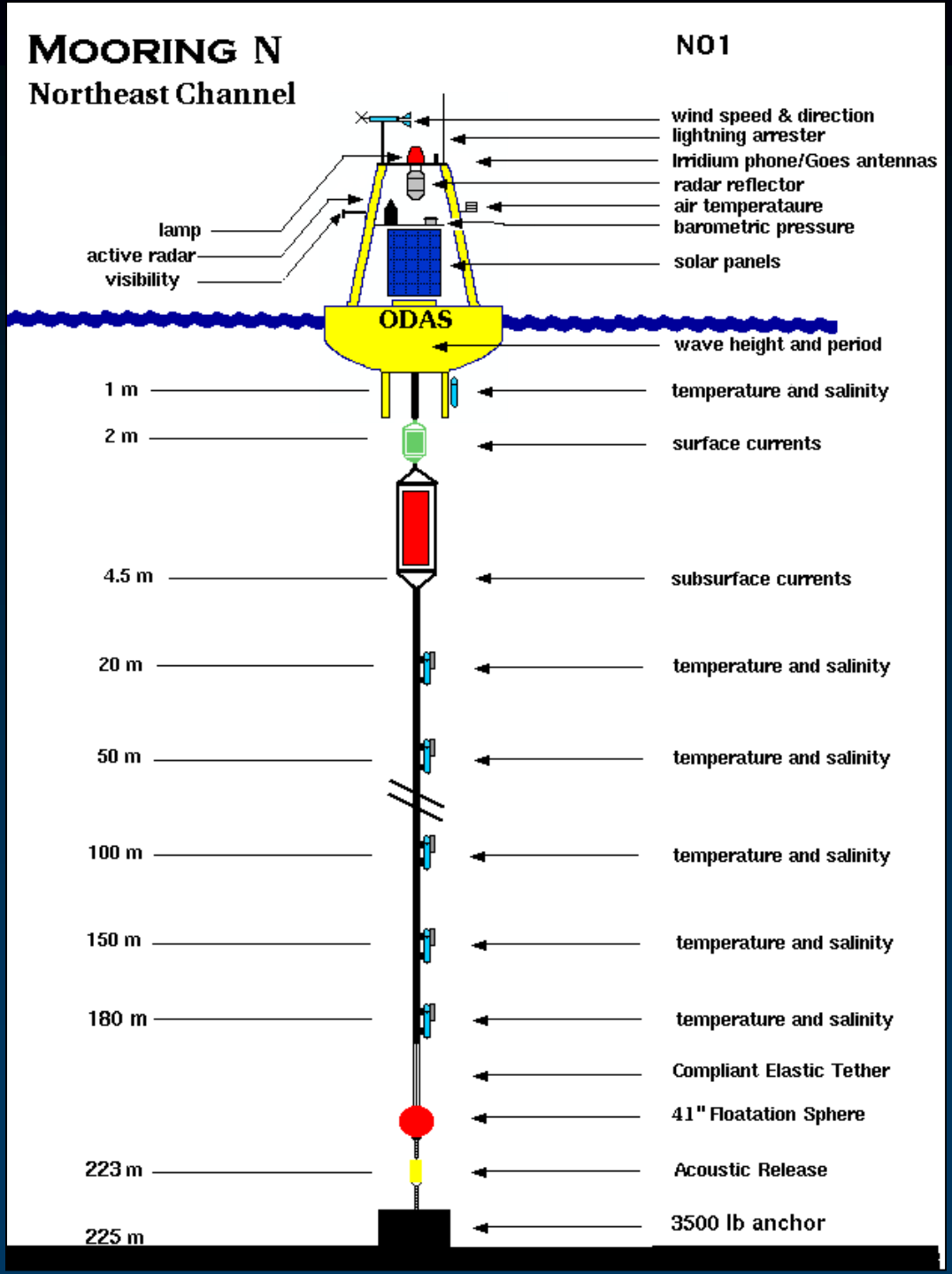
…and more

Buoys



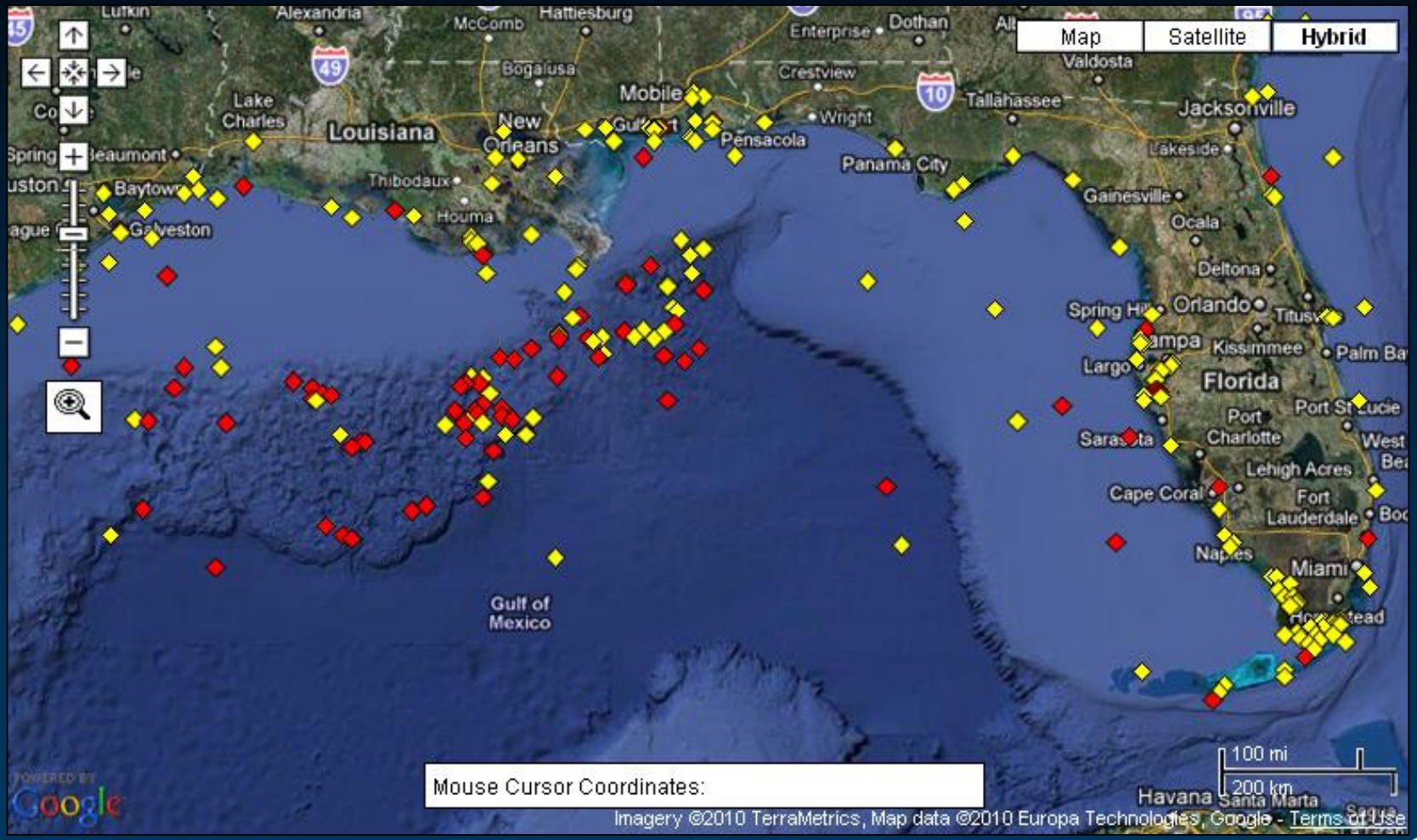
From Gulf of Maine Ocean Observing System (GoMOOS)

Buoys



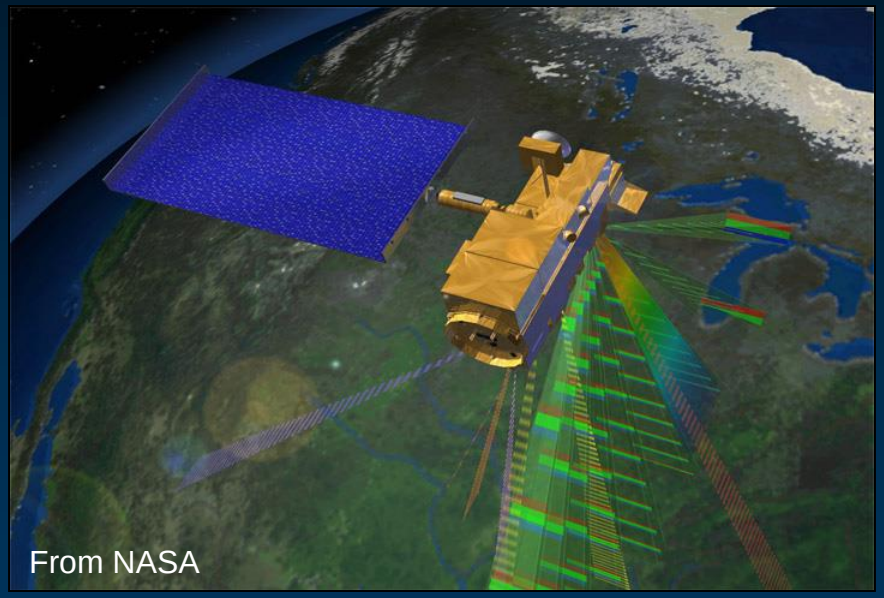
From Gulf of Maine Ocean Observing System (GoMOOS)

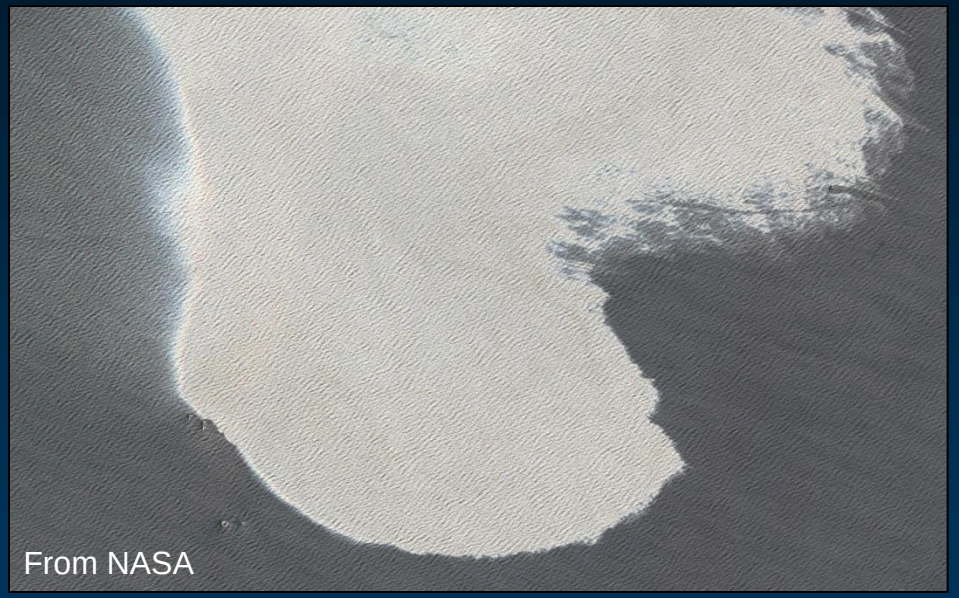
Buoys


Map
Satellite
Hybrid
Louisiana
Florida
Gulf of Mexico
Mobile
Pensacola
New Orleans
Tallahassee
Jacksonville
Orlando
Miami
Tampa
Lake Charles
Houma
Thibodaux
Galveston
Baytown
Panama City
Gainesville
Ocala
Deltona
Kissimmee
Lehigh Acres
Cape Coral
Fort Lauderdale
Naples
Sarasota
Port Charlotte
Largo
Valdosta
Crestview
Bogalusa
Hattiesburg
McComb
Alexandria
Dothan
Enterprise
Wright
Lakeside
Havana
Santa Marta
100 mi
200 km
Mouse Cursor Coordinates:
Imagery ©2010 TerraMetrics, Map data ©2010 Europa Technologies, Google - Terms of Use

Satellites

Satellite photos and data-images were, and will continue to be, integral in the monitoring and clean up of the Gulf oil spill





Satellites

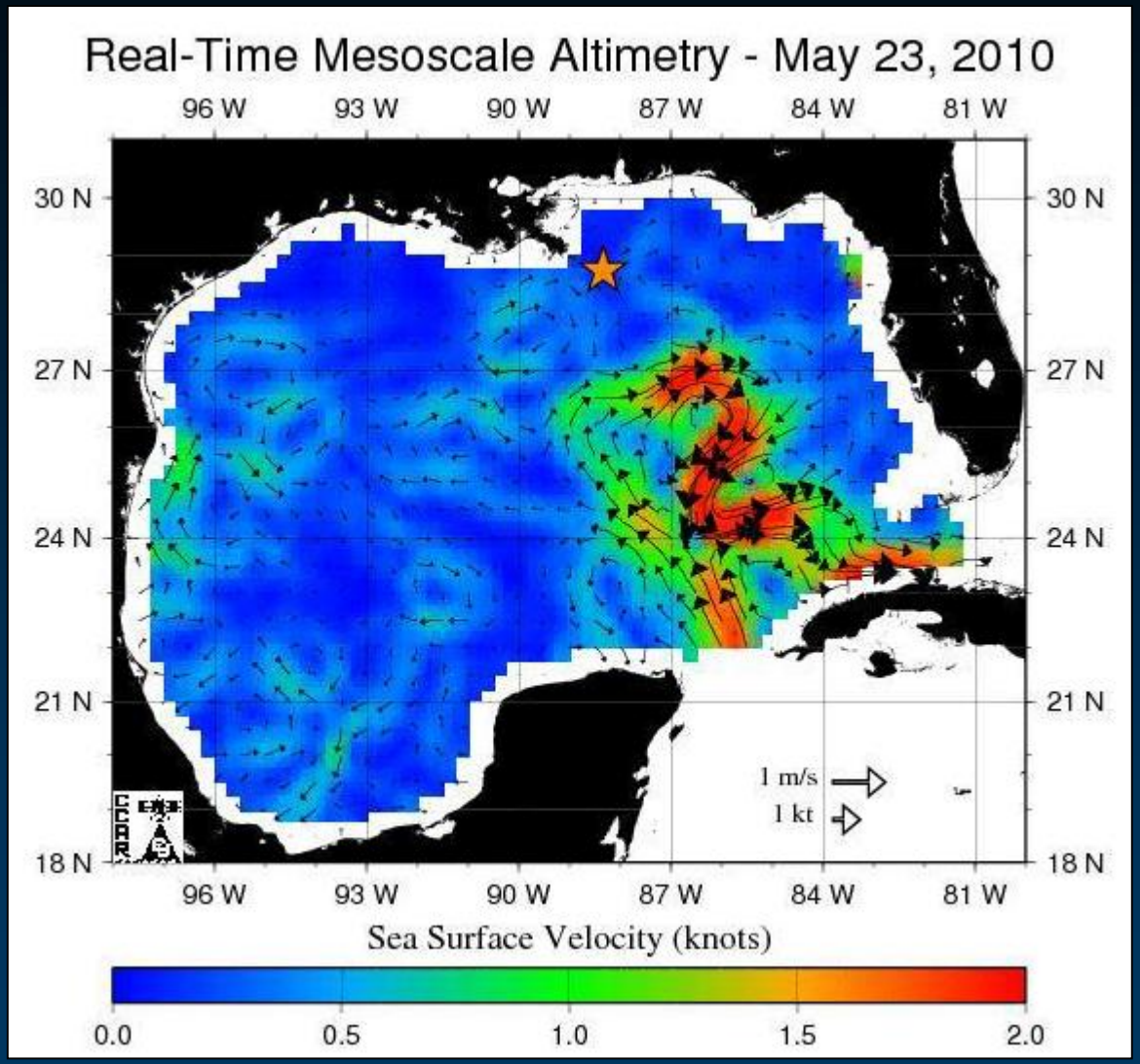
From National Geographic

Taken on 4/21/2010. You can see the burning oil rig and smoke moving to the southeast.

Satellites

Taken 4/25/10. Oil slick as seen from NASA satellite.

Satellites



From NASA

Satellite image of sea surface currents as measured using sea surface altimetry. The Loop Current can be seen in larger vectors and faster speeds.

High Frequency (HF) Radar

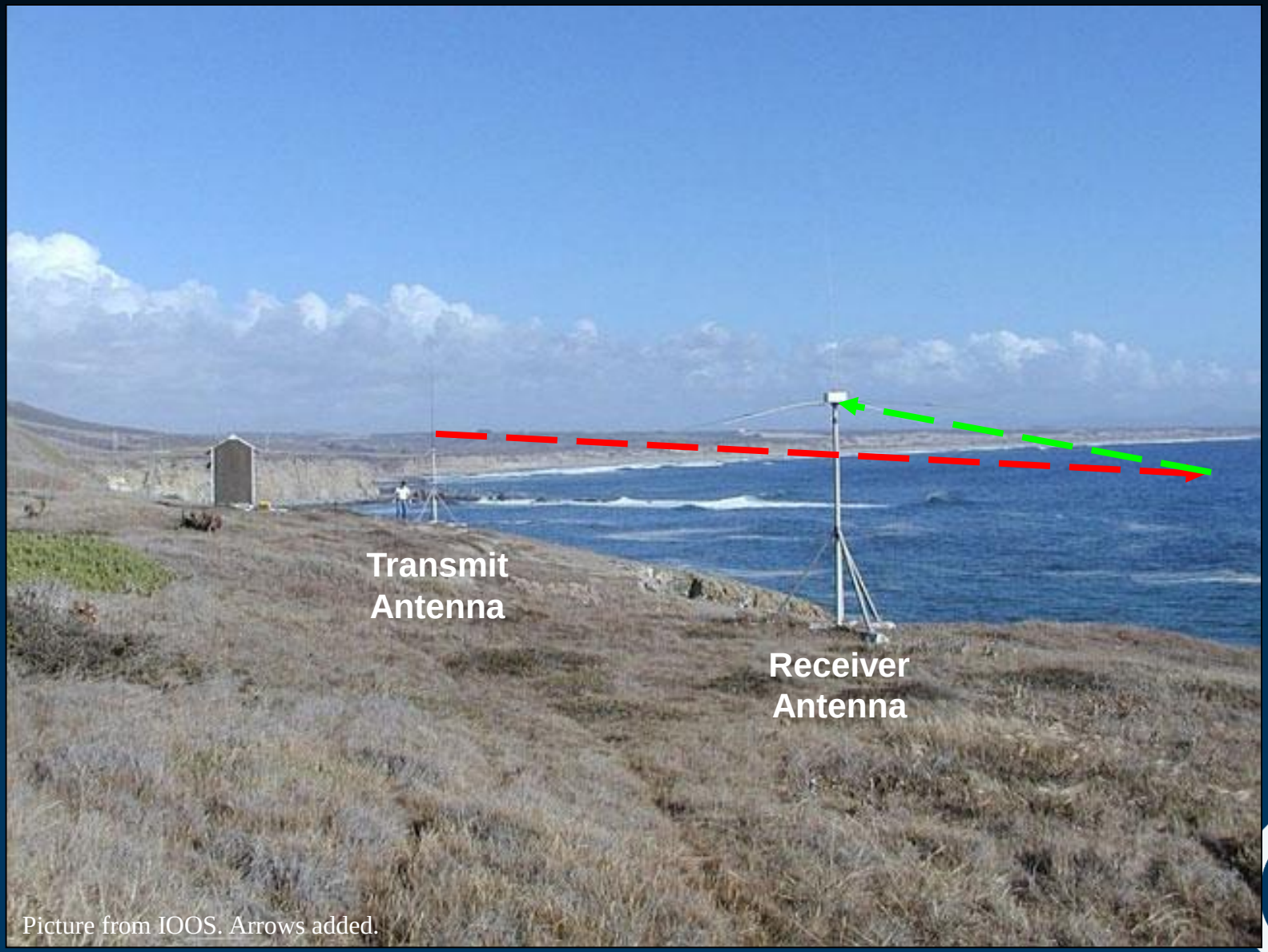
Transmit Antennas

Receive Antenna

- Originally designed to track submarines during WWII
- Now used to measure surface water currents' speed and direction

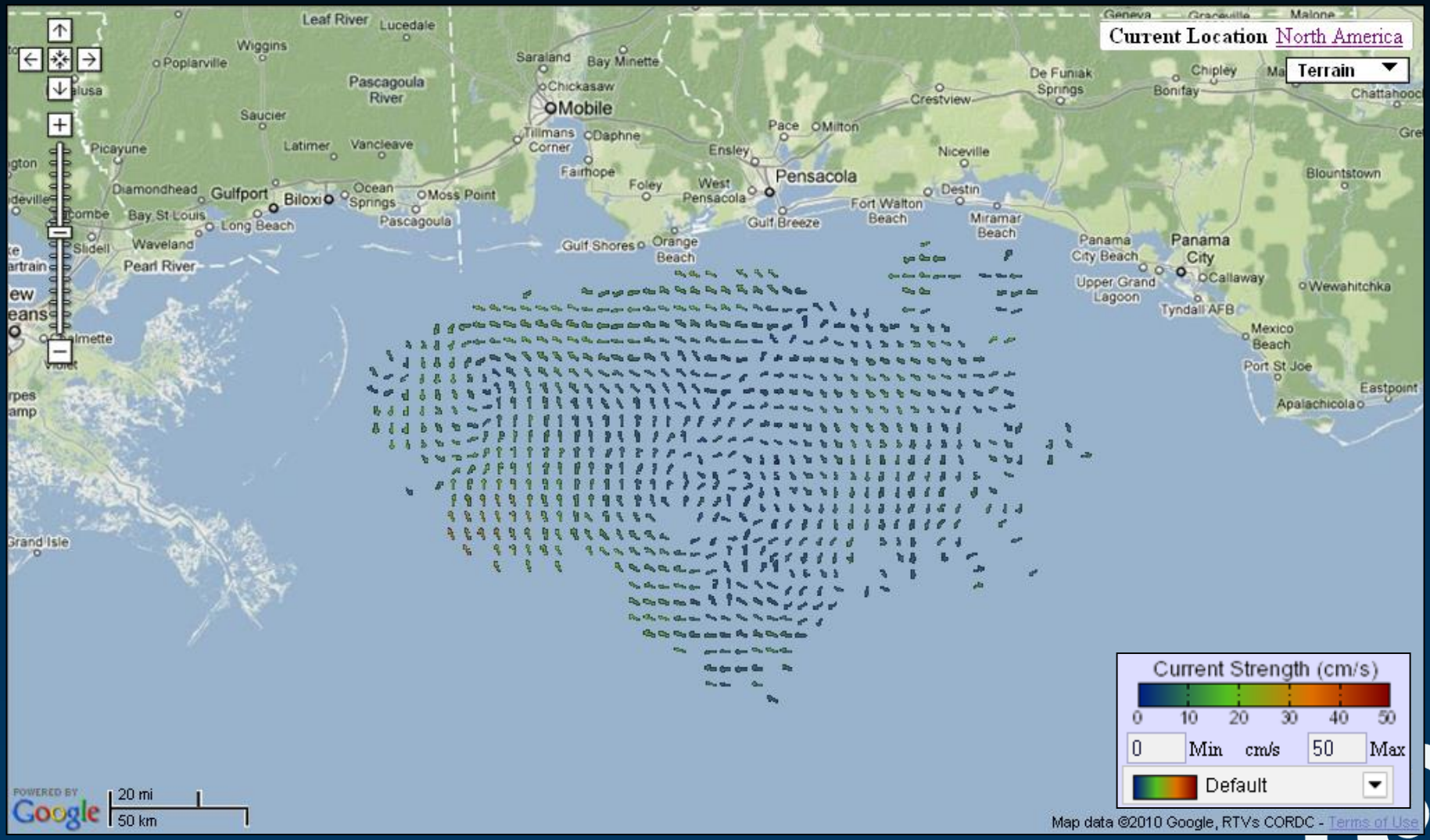
From J. Kohut; Rutgers Coastal Ocean Observation Lab (COOL)

High Frequency (HF) Radar



Picture from IOOS. Arrows added.

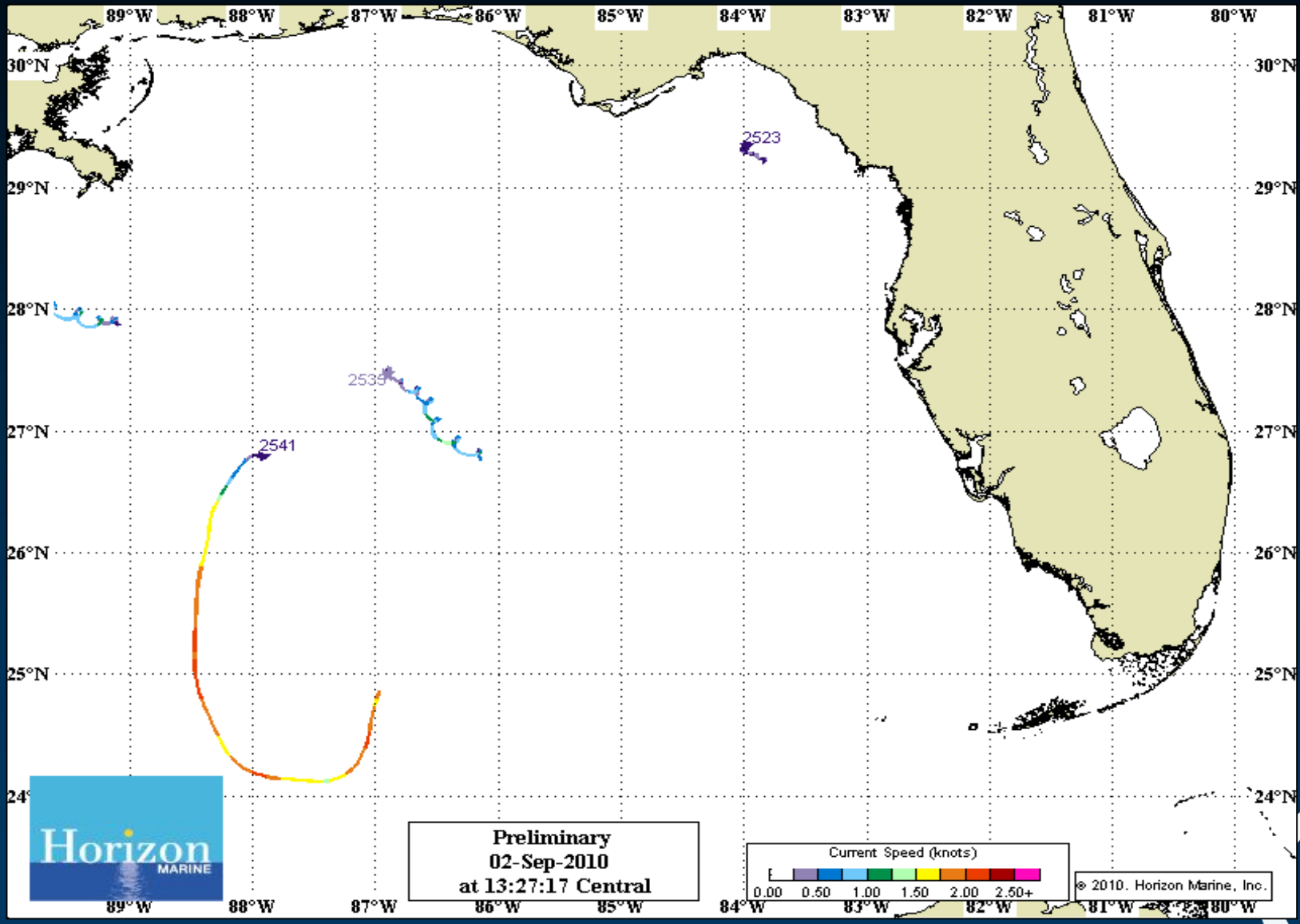
High Frequency (HF) Radar



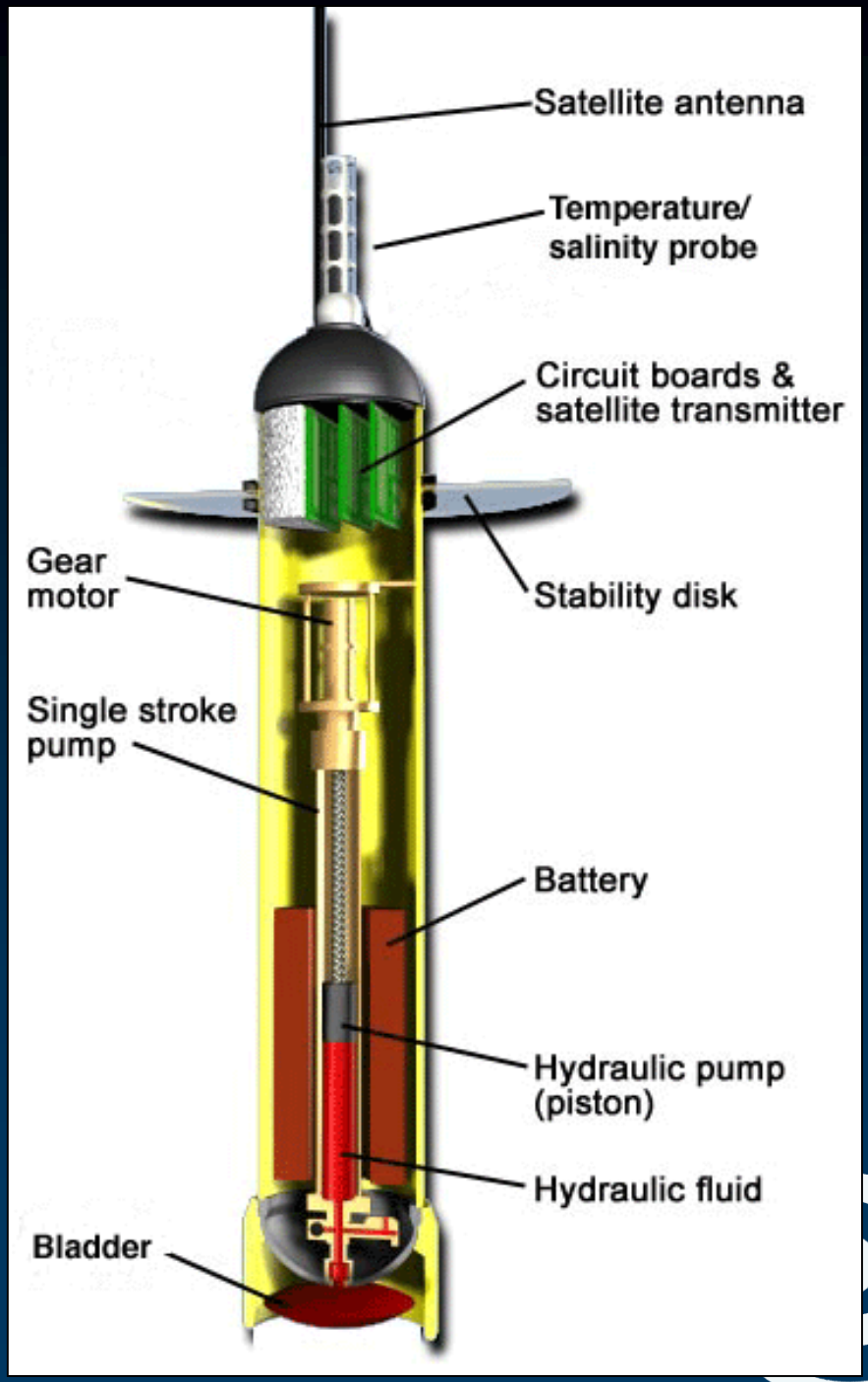
Air-deployed Drifting Buoys

From Horizon Marine

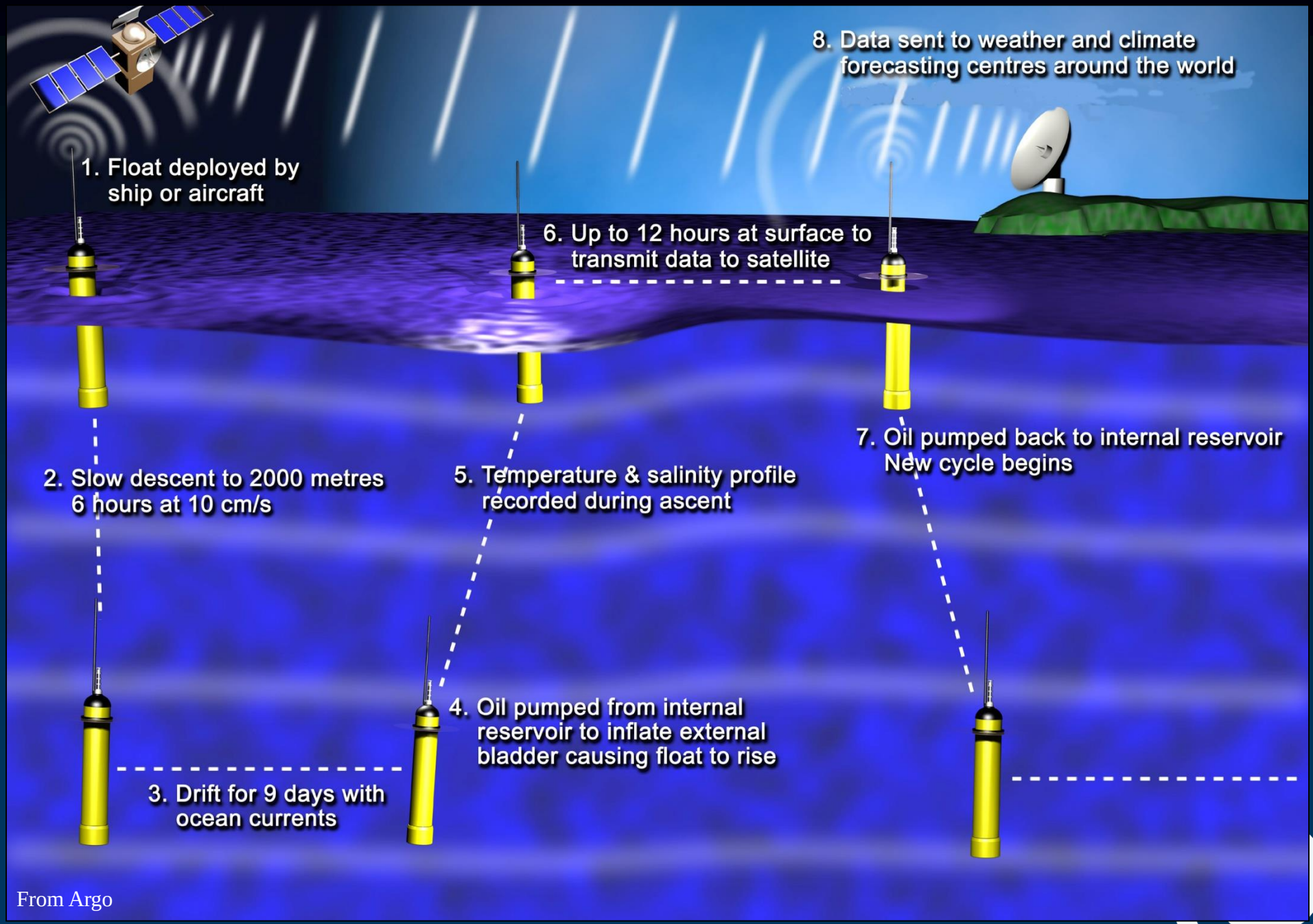
Air-deployed Drifting Buoys



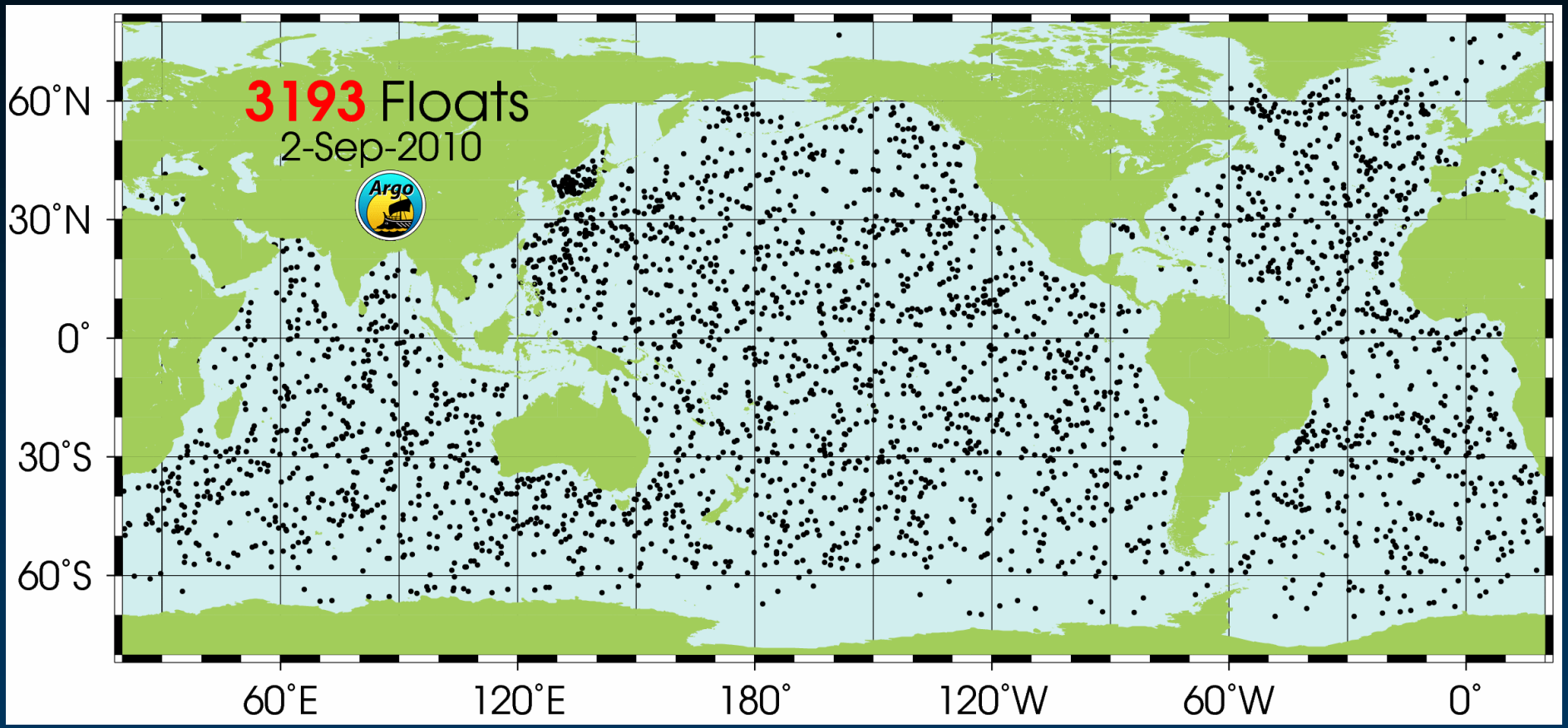
Argo Floats



From Argo


8. Data sent to weather and climate forecasting centres around the world
1. Float deployed by ship or aircraft
6. Up to 12 hours at surface to transmit data to satellite
7. Oil pumped back to internal reservoir New cycle begins
2. Slow descent to 2000 metres 6 hours at 10 cm/s
5. Temperature & salinity profile recorded during ascent
4. Oil pumped from internal reservoir to inflate external bladder causing float to rise
3. Drift for 9 days with ocean currents
From Argo

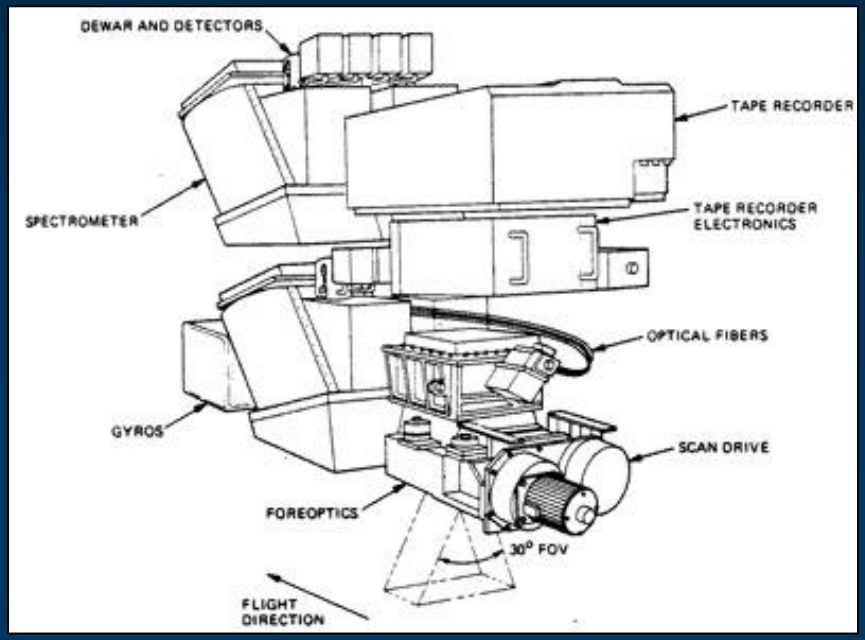
Argo Floats


3193 Floats
2-Sep-2010
Argo
60°N
30°N
0°
30°S
60°S
60°E
120°E
180°
120°W
60°W
0°

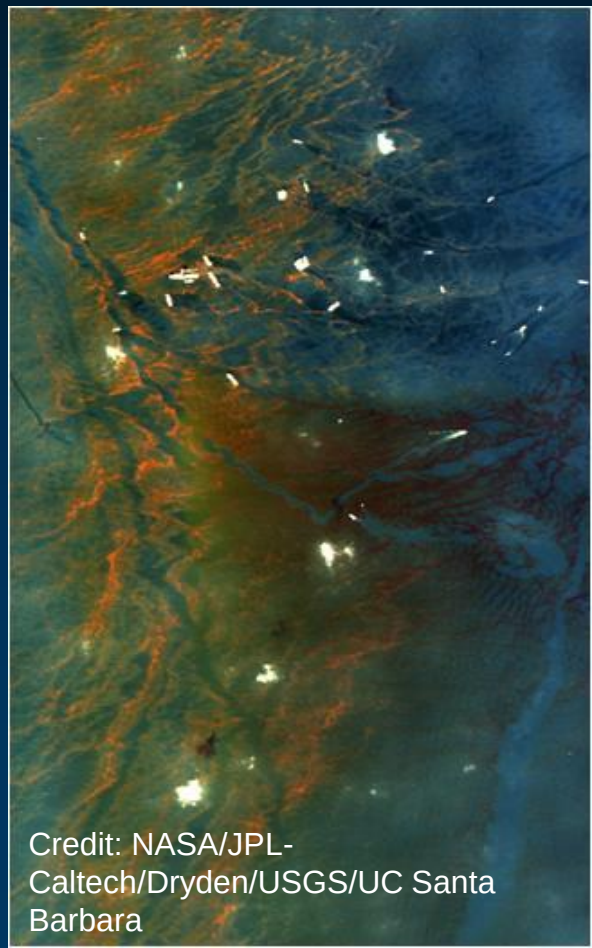
Aircraft-mounted sensors

NASA's Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) is used to map the occurrence, amount, thickness and condition of surface oil in the Gulf of Mexico.


Credit: NASA DFRC



Top: NASA ER-2 aircraft, on which AVIRIS was mounted. Bottom: Labeled figure of AVIRIS. Right: AVIRIS map of Louisiana coast and surface oil.


Credit: NASA/JPL-Caltech/Dryden/USGS/UC Santa Barbara

On-site Research Vessels

NOAA R/V Henry B. Bigelow. From nola.com.

NOAA R/V Gordon Gunter. From NOAA.

NOAA R/V Pisces. Credit: NOAA.

NOAA R/V Nancy Foster. Credit: NOAA.