

Upper Ocean Dynamics Laboratory:

Flight Summary: NOAA WP-3D

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Tasking: On Saturday, 5 May 2010, a NOAA P-3 aircraft was tasked to the Deepwater Horizon oil spill area of the Gulf of Mexico. The overall objective is to provide an exploratory, baseline oceanic temperature survey to map oceanic structure between the Loop Current (LC), which has a surface current speed of 3 knots, and its surrounding eddy field including both the clockwise and counterclockwise rotating eddies. Such measurements provide the important data to correlate to surface images and data from satellite measurements as well as provide initial subsurface structural conditions for predictive ocean models.

Flight Tracks: Takeoff time was 14:56Z from MacDill United States Air Force Base and the flight duration was ~8 hours following the grid in Figure 1. During the first two legs, the aircraft was flown at 1000 ft to be below the cloud deck to avoid dropping profilers on other aircraft or containment vessels. On the 6th profiler at 86° 30'W, 28° 20'N, we began to see oil globs (see Figure 2). The oil slick only got bigger as the aircraft flew westward toward the Deepwater Horizon Site. The remaining legs of the grid, the flight level was 6000 ft. Oil was not seen again until the final leg of our grid where the aircraft traveled due north along 88°W into the main oil spill area.

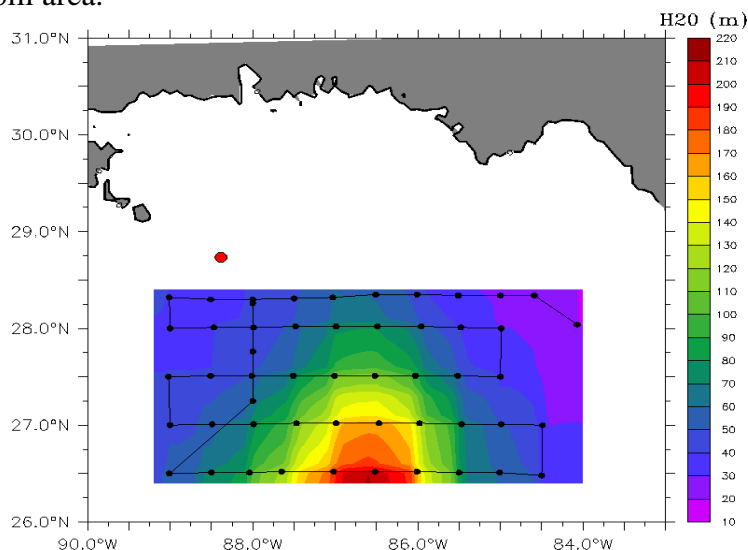


Figure 1. Depth (m) of the 20°C isotherm with flight pattern overlay. The red dot represents the location of the Deepwater Horizon Rig, the source of the oil spill.

Measurements: Atmospheric dropsondes (for surface winds) and AXBTs (capable of sampling to 350 m) were deployed in a lawnmower style grid shown in Figure 1. Five legs of the grid were spaced at 0.5° intervals (~55 km) from 28° 21' N to 26° 30' N and spanned from 89°W to 84° 30'W. The northern edge of the grid was at 28° 20'N due to the restricted no-fly zone in the NW part of the grid. In total, 52 AXBTs were dropped with 6 failing (~10%). As shown in this figure, the depth of the 20°C isotherm is about 180 m deep-indicative of the deep warm structure of the LC. On its perimeter, this isotherm depth decreases to less than 40-m presumably associated with the eddy field. Such large changes over relatively short distances is what forces the energetic LC speeds.



Figure 2. Oil globs on the surface of the ocean at $86^{\circ} 30''\text{W}$, $28^{\circ} 20''\text{N}$ from the NOAA WP-3D downward-looking camera.

In addition, the NOAA WP-3D research aircraft was also outfitted with the Stepped Frequency Microwave Radiometer (SMFR) and the downward looking Infrared Radiometer Thermometer (IRT) acquired data on sea surface properties such as Sea Surface Temperatures (SST) and Brightness Temperatures from the multiple channels from the SFMR. These measurements allow us to distinguish between the oil slick mass and the surrounding sea water. These data have not been processed.

Next Flight: The next flight should be scheduled later on this week to assess differences in the temperature structure as the Loop Current changes.