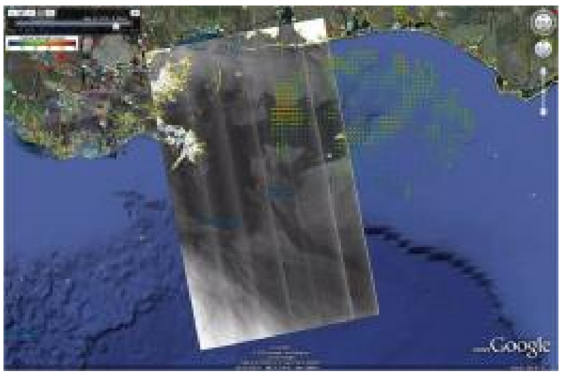
PHYS.ORG

Deepwater lessons

December 15 2010, By Mario C. Aguilera and Robert Monroe



The Coastal Ocean Research and Development Center provided wave and surface current data for oil leak responders after reviving three high-frequency radar stations owned by the University of Southern Mississippi. The units had been shut down when funding ran out. The radar data, here superimposed on satellite imagery of the surface oil slick from Deepwater Horizon, contributed to Gulf of Mexico daily ocean condition updates.

In the 24-hour news cycle era, the Deepwater Horizon oil leak in the Gulf of Mexico already feels like an event from yesteryear, an event that had its 15 minutes of news domination during the summer of 2010 then made room for the next big story once the wellhead was capped.

But though gulf residents fear that they will be forgotten as cleanup crews pack up and leave, the inquiry into the oil leak is only beginning on scientific fronts. As the federal government continues to review its initial response to the disaster, research institutions are seeking portions of a $500 million reserve that BP has pledged to studying the long-term effects of the leak.

The gulf's health isn't the only open question. Scripps Institution of Oceanography, UC San Diego researchers were in the first wave of response within weeks after the initial explosion on the doomed oil rig. In separate field projects, Scripps science teams monitored marine mammals, looked for subsurface oil plumes using programmed gliders and brought dormant radar stations online to make near real-time maps of surface currents.

Now that the immediate crisis is over, several of them say that the accident illustrates the need for continuous oceanographic monitoring of all American coastlines and the need for rapid sharing of information, both of which were in short supply immediately following the leak-triggering disaster.

'I've Got To Do This'

Scripps development engineer Ethan Roth's task was to retrieve and redeploy a scientific instrument that has been recording marine mammal sounds in the Gulf of Mexico for more than three months. The instrument bore vital information about how millions of gallons of oil might impact whales and dolphins in the region.

While he prepared for the recovery operation on Sept. 4, conditions in the gulf were clear and balmy. But the following morning, when Roth hit a button on a lunchbox-sized control box that sent an instrument rising 980 meters (3,215 feet) from the Gulf of Mexico seafloor to the surface—fewer than 10 miles from the Deepwater Horizon well explosion site—the skies were dark and imposing, but rain-free. Now, looking over their shoulders, Roth and others aboard the Ocean Alliance research ship Odyssey could feel the wind whipping and see a squall heading their way. Twenty minutes later, by the time the marine mammal sound recording instrument breached the sea surface and was spotted from the ship's deck, the heavens poured.

By now, Roth and Odyssey first mate Ian Glass were dispatched on a skiff to capture the floating HARP, or high-frequency acoustic recording package, and its precious cargo of data. Under the deluge they grappled, then seized the instrument, and moments later it was craned aboard *Odyssey*.

A soggy Roth brought the HARP safely inside the ship's main cabin just as the downpour ceased, marking the termination of the successful recovery operation.
Roth opened up the HARP's body and extracted 16 memory disks carrying nearly two terabytes of acoustic data. He later installed replacement disks and fresh batteries. The following morning, the reinvigorated HARP sunk back down to the dark bottom of the Gulf of Mexico.

In April, Scripps oceanography professor John Hildebrand joined the rest of the world in watching astonished as news feeds relayed the environmental horror of gushing oil. As head of the Scripps Whale Acoustics Lab, Hildebrand mulled over his options, having never conducted research in the Gulf of Mexico. A week after the explosion, he moved into action, coordinating the retrieval of a HARP instrument off La Jolla, Calif., on May 6. Within five days—the blink of an eye for similar scientific deployments—the device was on a plane headed to New Orleans, then stationed on a ship, and finally redeployed within sight of *Deepwater Horizon*.

HARPs employ hydrophones, or underwater microphones, to record clicks, moans, whistles and songs from marine mammals and allow Hildebrand and his team to monitor population sizes, behaviors, and habitats.

"After a week of the oil flowing I said, 'I've got to do this,' and then I did everything I could to get the HARP there as fast as I could," said Hildebrand. "We want to see if there are trends—do we see the number of animals trending downward?—and to find out what the impact of the oil is."

Hildebrand later deployed four additional HARPs around the gulf to augment the assessment, providing baseline data outside the area of the spill.

Upon Roth's return to Scripps and delivery of the disks to Hildebrand, the data recorded on them were immediately processed by sound analyzers to begin telling the tale of how oil affected some the gulf's largest inhabitants.

"It's important, given that we've developed this new technology for monitoring marine mammals, that it be brought to bear when there is a need," said Hildebrand. "It seemed like going there and providing expertise was the right thing to do because this is the best capability for figuring out the presence of marine mammals."

By mid-October, preliminary analysis of the data shows that whales and dolphins remained in the vicinity of the well during the leak. Further details are pending.

Hildebrand's challenges were not merely scientific. Like several other academic centers drafted into service during the leak, Scripps objected to BP's initial insistence on controlling the distribution of data such as his whose collection it funded. After negotiation, Scripps and its mission of making science available to all won out over BP's interpretation that data from a research project should be proprietary. Hildebrand will be free to publish his findings when they are ready.

Model Behavior

Like Hildebrand, Scripps physical oceanographer Dan Rudnick rerouted an instrument from the Pacific Ocean to the gulf. Rudnick oversees the operation of Spray gliders, programmable craft that can dive and rise in transects to create profiles of salinity, temperature and current at various depths. The glider fed data to ocean circulation models that guided spill response overseers.

Rudnick also added a fluorometer and acoustic profiler to the payload of the glider to enable it to detect plumes of subsurface oil. On Sept. 20, his lab retrieved the glider after 105 days of measurements in the gulf. Because of the Scripps team's experience navigating gliders through strong currents, Spray was the lone glider among eight sent to the gulf to traverse the powerful Loop Current, which had been initially identified as a likely conduit by which oil from the leak would reach the Atlantic Ocean.

Rudnick found his experience of the overall mobilization a heartening demonstration of what science can do in a crunch but if the spill zone had the kind of monitoring network California had, "they would have had the observations from day one instead of day 30," Rudnick said.

"The only way to assure that you have working instruments ready to go is to be using them," he said.

Eric Terrill and the Coastal Ocean Research and Development Center (CORDC) at Scripps had been in the midst of a BP-funded project to mount high-frequency radar onto an oil rig 100 miles southwest of the broken wellhead when the disaster happened. Radar is used to view and track surface currents.

Terrill's group was not able to get the radar station mounted onto the rig

Atlantis operational until August. NOAA, however, funded a CORDC effort to bring online three Gulf Coast radar stations owned by the University of Southern Mississippi that had been turned off when funding for their operation ran out. For the duration of the oil leak response, Scripps added daily surface current data that gave responders their best guess as to where the oil was going to go. The data were used by NOAA forecasters to decide where to direct containment booms.

BP is also funding an experiment by Terrill's lab to test drifting buoys that measure surface currents and waves, a capability that could dramatically improve tracking the path of future oil spills. Like Rudnick, Terrill notes the advantage responders would have had if such extensive modeling were available before the oil leak. Networks in California had already proven their value during a 2009 oil spill in San Francisco Bay. It was also because of the existence of such networks that NOAA was familiar with the current maps that high frequency radar could provide. The $21 million in state funding for circulation monitoring efforts runs out at the end of the year. Terrill says the case for extending its funding is more obvious than ever.

"All too often, it's difficult to get the resources in place for sustainable observations, but then an event like this comes along to remind people that there is inherent risk with at-sea production and transfer of petroleum," said Terrill. "Hopefully this event will have some good in spurring a national investment in improved infrastructure designed to predict our coastlines."

Threats Larger Than Oil

To hear some analyses, the gulf oil leak is an event that has concluded, having left ecosystems there in far better shape than many had feared it would have. Scripps marine ecologist Jeremy Jackson, however, knows better.

More than 20 years ago Jackson studied the impacts of a pair of oil spills off Panama that wreaked environmental havoc on the country's coastal ecosystems. Jackson saw death and destruction wherever the oil touched. Dead coral reefs. Black zones of destroyed mangroves. Devastated seagrasses.

Yet damage from the two million-gallon spills he assessed are a pittance compared with more than 200 million gallons gushed from *Deepwater Horizon*.

The full scope of the damage, Jackson says, is troublingly masked because many vital ecosystem components are too small or too deep to be seen by the human eye.

"Who cries for the plankton? Who cries for the minnows?" asks Jackson. "The stuff you can't see is the basis of the food chain and every bit as important as the charismatic birds, whales, and dolphins. The oil is certainly drastically disrupting the food chain of the entire northern gulf."

Even with the enormity of the oil's damage, Jackson remains adamant that other, rising threats to the ocean's health are far more serious. Once the oil impacts lessen in the years and decades ahead, overfishing, pollution, and climate change will remain as dangers.

"We have to hope that there will be an increased awareness of the fragility of the ocean that will emerge from the horror that people have seen and experienced (in the gulf),' says Jackson, "so that there is a new seriousness about the magnitude of the other problems."

More information: This story was originally published in *Explorations*.

Provided by University of California - San Diego

Citation: Deepwater lessons (2010, December 15) retrieved 20 April 2024 from
https://phys.org/news/2010-12-deepwater-lessons.html