May 28, 2010

Scientists Build Case for Undersea Plumes

By JUSTIN GILLIS

IN THE GULF OF MEXICO — The ocean caught fire.

As it blazed, a dense column of black smoke rose toward the sky. Oily water, the color of strong tea, slopped up the sides of boats. The breeze carried an acrid smell, like gasoline fumes.

Aboard the research vessel F.G. Walton Smith, anxiety was growing.

Five scientists and six students had come to study the oil leak and its effect on the sea. They brought flasks and gloves, refrigerators and freezers, tiny tools and huge cylinders of gas.

They were not looking for oil on the surface, where it was so thick in places that it was being burned off, but for plumes of fine oil droplets far beneath the waves.

The stakes were high. Two weeks earlier, when some of these scientists had disclosed evidence of undersea oil plumes, their claim had been greeted skeptically by the government. The scientists' credibility was on the line.

If the plumes did exist, much of the wisdom about combating oil spills might need to be reconsidered. The plumes would suggest that any future oil leak in deep water could be expected to do much of its damage in the sea, not on shore.

But where were the plumes?

After a slow start, American science is finally beginning to tackle the oil disaster in earnest. The

National Oceanic and Atmospheric Administration, the federal agency charged with monitoring the health of the oceans, is sending multiple boats into the gulf. The National Science Foundation, another arm of the government, is issuing rapid grants to finance academic teams, including the one aboard the Walton Smith. BP, the oil company responsible for the spill, has pledged $500 million for research. And scientists like those aboard the Walton Smith are getting emergency financing from the government for their studies.

This stepped-up effort is starting to bear fruit. This week, another research vessel confirmed the existence of a huge undersea plume. And on Thursday, a team of scientists appointed by the Obama administration offered a more credible estimate of the flow rate at the broken well, putting it at two to four times the previous calculation.

That higher estimate only added to the sense among academic scientists that much of the oil must be hovering in the deep sea, instead of surfacing. The goal of the researchers aboard the Walton Smith was to nail the existence of such deep-sea plumes beyond any doubt.

They sailed early this week from Gulfport, Miss., and went back to the spot where they had originally discovered a large plume. It was no longer there.

All one afternoon, the Walton Smith hopscotched across the gulf. The top scientists on board, Samantha Joye of the University of Georgia and Vernon Asper of the University of Southern Mississippi, peered intently at instrument readouts, hoping for a signal.

Down to the bottom of the sea went a huge apparatus designed to test the water and grab samples of it. The results kept coming up clean.

Then, late in the afternoon of the second day at sea, the entire scientific crew suddenly leapt to attention.

The boat had arrived at a new sampling site, west of the oil leak, and the instruments were traveling once again to the bottom. In a clean ocean, they would be expected to produce fairly straight lines on a graph.

Instead, wild squiggles were showing up. The display looked like one of those seismograph readings taken in the throes of an earthquake. At three different depths, the instruments picked up plumes of material drifting through the deep ocean.

Dr. Asper stood back, arms crossed, watching the squiggles appear. “To see something like this is a once-in-a-lifetime thing,” he said. “It’s really remarkable.”

Soon, a giant winch on the rear of the boat hauled special bottles back from the deep, carrying water samples. The younger researchers rushed to the rear deck.

Working quickly in a daisy chain, circling the bottles, they filled small vials and other containers, then hustled back to their makeshift laboratory on the main deck of the Walton Smith.

Over the next few hours, they filtered some of the water. They shook some samples. They stirred some. They pickled some. They bubbled gases through the water. They refrigerated some vials. They froze some more.

Then they got ready to do it all again.

Within a day, word would come that a separate university vessel, the Weatherbird II, had discovered a giant plume stretching in the other direction from the broken well, toward Mobile Bay. That one threatens some of the finest fishing territory in the gulf.

It will take weeks of laboratory work to confirm with certainty that the plumes are made of oil droplets, or more likely, some complex mixture of oil and natural gas. If that idea holds up, the existence of these undersea plumes may well turn out to be the major scientific discovery of the great oil spill of 2010.

It could take years for scientists to assess the deep-sea damage fully, if that is even possible. Among other problems, gulf researchers have long been hobbled by a critical shortage of vessels equipped for oceanography.

Only a handful of such ships ply the Gulf of Mexico, and the best-outfitted boats tend to work for the oil industry. Exploring and protecting the gulf has simply not been as high a national priority as drilling it for oil.

Still uncertain are the fates of deep coral reefs that live in the gulf, as well as the condition of a unique cluster of bottom-dwelling organisms only nine miles from the damaged well. The ultimate impact the spill will have on commercially important fish like tuna and snapper is

anyone's guess.

As the week wore on, the Joye-Asper team found more and more evidence for the existence of the plumes.

The water samples they pulled up suggested that any oil in the plumes was highly diffuse — not even visible to the naked eye. But when several gallons of the water were forced through a fine filter, tiny black oil droplets appeared.

Even in that diffuse form, the plumes were having a drastic impact on the chemistry of the ocean, with dissolved oxygen levels plunging as each plume drifted through the sea.

That, Dr. Joye said, was most likely because bacteria were ramping up to consume the oil and gas — a good thing, over all, but it was creating a heavy demand for oxygen and other nutrients. Aside from the toxic effect of the oil, the declining oxygen was a potential threat to sea life.

Slowly, as the Walton Smith and other boats worked the gulf this past week, the weird physics of a deep-water well blowout came into better focus. The idea that oil rises quickly to the surface of an ocean may be one of the casualties of this disaster.

"Nothing really makes sense out here," Dr. Joye said as her ship plowed through orange slicks of oil. "I don't know that you can necessarily trust your intuition."

From the bridge of the ship, Capt. Shawn Lake made an announcement. Everyone rushed to the outside decks.

Once again, in the middle distance, the ocean was burning.