New study argues against conclusion that bacteria consumed Deepwater Horizon methane

May 26 2011

A technical comment published in the current (May 27) edition of the journal *Science* casts doubt on a widely publicized study that concluded that a bacterial bloom in the Gulf of Mexico consumed the methane discharged from the Deepwater Horizon well.

The debate has implications for the Gulf of Mexico ecosystem as well as for predictions of the effect of global warming, said marine scientist and lead author Samantha Joye, University of Georgia Athletic Association Professor in Arts and Sciences.

Based on methane and oxygen distributions measured at 207 stations in the Gulf of Mexico, a study published in the January 21, 2011 edition of *Science* concluded that "nearly all" of the methane released from the well was consumed in the water column within approximately 120 days of the release. In the current paper in *Science*, Joye and co-authors from 12 other institutions make the case that uncertainties in the hydrocarbon discharge from the blowout, oxygen depletion fueled by processes other than methane consumption, a problematic interpretation of genetic data and shortcomings of the model used by the authors of the January study challenge the attribution of low oxygen zones to the oxidation of methane gas.

"Our goal is to understand what happened to the methane released from the Macondo discharge and in the larger framework, to better understand

the factors that regulate microbial methane consumption following large-scale gas releases," said Joye, a professor in the UGA Franklin College of Arts and Sciences. "I believe there is still a lot to learn about the environmental factors that regulate methane consumption in the Gulf's waters and elsewhere."

Joye and her co-authors note that low levels of oxygen are known to occur in the Gulf of Mexico because of bacterial consumption of carbon inputs from the Mississippi River as well as the bacterial consumption of hydrocarbons that naturally seep from the seafloor. The researchers point out that given the uncertainty in oxygen and methane budgets, strong supporting evidence is required to attribute oxygen depletion to methane removal; however, a study published in the October 8, 2010 edition of *Science* showed low measured rates of methane consumption by bacteria. Joye and her co-authors note that samples from the control stations and the low-oxygen stations that were analyzed for unique genetic markers in the January 2011 study showed no significant difference in the abundance of methane consuming bacteria. Joye and her colleagues also argue that the model the study used neglected important factors that affect the transport and biodegradation of methane, and that it only provided a tentative match of the observational data.

Methane is a potent greenhouse gas, and understanding the fate of the methane released from the Deepwater Horizon well has implications for the entire planet, since global warming is likely to accelerate the release of methane that is currently trapped in hydrates on the seafloor. Based on the conclusion that bacteria had rapidly consumed the methane released from the Deepwater Horizon well, the January 2011 *Science* paper suggested that methane released from the oceans may not be likely to amplify an already warming climate.

Joye and her colleagues note that several other studies have found that

considerable amounts of methane released from natural deep-sea vents are not consumed by microbes. The most vulnerable store of methane hydrates is not in the Gulf of Mexico, they also point out, but in the deposits that underlie the shallow waters of the Arctic.

"A range of data exists that shows a significant release of methane seeping out at the seafloor to the atmosphere, indicating that the microbial biofilter is not as effective," Joye said. "Importantly for the future of the planet, there is even less evidence for a strong biofilter of methane hydrate destabilized in the shallow Arctic settings."

Provided by University of Georgia