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A Rapid Response Study of the Hercules Gas Well Blowout

Samantha Joye
University of Georgia

Joseph P. Montoya
Georgia Institute of Technology

Steven Murawski
University of South Florida, smurawski@usf.edu

Tamay Özgökmen
University of Miami

Terry L. Wade
Texas A&M University

See next page for additional authors

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Authors

Samantha Joye, Joseph P. Montoya, Steven Murawski, Tamay Özgökmen, Terry L. Wade, Raffaele Montuoro, Brian J. Roberts, David Hollander, Wade H Jeffrey, and Jeffrey Chanton

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On 20 April 2010, the Deepwater Horizon drilling rig lost well control while drilling at the Macondo prospect in the Gulf of Mexico. At the time of the Macondo blowout, the academic scientific community was ill prepared to initiate and rapidly conduct the necessary coordinated interdisciplinary studies of the environments around the discharge area.

On 23 July 2013, a gas production platform owned by Hercules Offshore developed a leak. Subsequently, the platform ignited (Figure 1) and was severely damaged, although the well appeared to self-seal several days later through bridging over, a process through which rocks or sand in the well plug the hole. The uncontrolled discharge therefore apparently lasted less than a week, limiting the release of oil and gas into the environment. Unlike the Macondo blowout, the academic response to the Hercules blowout was swift, efficient, and well coordinated with federal response efforts.

In part, the improved academic response capacity was due to collaborations initiated through the U.S. National Science Foundation's Rapid Response Program, which fueled significant scientific advances in the wake of the Macondo blowout. In addition, the Gulf of Mexico Research Initiative (GoMRI; <http://gulfresearchinitiative.org/>) established a large collaborative network through which this response effort was coordinated. GoMRI is a 10-year, \$500 million independent research program established by an agreement between BP and the Gulf of Mexico Alliance to study the effects of the Deepwater Horizon incident and the potential associated impact of it and similar incidents on the environment and public health.

Scientists from the Ecosystem Impacts of Oil and Gas in the Gulf (ECOGIG) consortium first learned of the Hercules blowout from Coast Guard radio traffic during a research cruise. ECOGIG co-principal investigator Samantha Joye began mobilizing resources and personnel for a rapid response research cruise. The consortia involved in the response included modelers (the Gulf of Mexico Integrated Spill Response Consortia (GISR), the Consortium for Advanced Research on Transport of Hydrocarbon in the Environment (CARTHE), and the Center for Integrated Modeling and Analysis of Gulf Ecosystems (C-IMAGE)) and oceanographers from ECOGIG, GISR, and the Coastal Waters Consortium (CWC).

Rapid Collaborative Science

Oceanographic research cruises require months of careful planning and preparation. Activities are planned in detail, with backup

plans in place to account for instrument failures, novel discoveries, etc. Preparing for a cruise in rapid response mode is not routine for academic oceanographers, but in the case of the Hercules response, fast action was critical for success. The team secured the Louisiana Universities Marine Consortium research vessel *Acadiana* for a research cruise; physical, biological, and chemical oceanographers worked together to develop the sampling program.

The GISR group used a state-of-the-art computer model to provide sampling guidance to the shipboard crew. CARTHE scientists supplied 20 surface drifters to track surface water masses near the Hercules platform (see http://carthe.org/hercules_info/carthe_hercules.mov).

The *Acadiana* science party also included biological oceanographers and a hydrocarbon geochemist; the team worked together to quantify concentrations of gas and oil in the water and sediments. Sediment cores were collected and transported back to the University of Georgia for measurements of geochemical parameters and microbial activity. A follow-up cruise to the area was conducted a month later by C-IMAGE and Deep Sea to Coast Connectivity in the Eastern Gulf of Mexico (Deep-C) scientists to evaluate whether traces of hydrocarbons still surrounded the failed platform.

Armed with results from the R/V *Acadiana* cruise, the team sampled primarily to the south and east of the failed platform. The initial

cruise revealed tenfold elevations in methane concentrations (hundreds of nanomoles) relative to background (2.5 nanomoles) 3 days after the blowout and clear carbon isotopic evidence of methane assimilation into microbial biomass around the platform. The combination of these two data sets will provide a before and after snapshot of this incident, but more important, these response cruises reflect just how much has changed since 20 April 2010, when the Deepwater Horizon disaster occurred.

The Need for Rapid Response Capability Within the Scientific Community

Disasters, whether natural or man-made, require rapid scientific response. Well-planned and coordinated efforts by scientists with relevant expertise help make it possible to obtain the proper data to document and quantify environmental damage and human impacts. Ideally, the data from such rapid responses are interpreted within the context of long-term monitoring data.

In the case of the rapid response study of the Hercules blowout, collegial connections established through the GoMRI network made it possible to assemble and deploy a collaborative, interdisciplinary science team to document the impacts of the well blowout in only 4 days. Hence, the researchers were able to capture the environmental signature of the event as it evolved.

Although the Hercules gas and oil release was a short-lived event, this effort illustrated an improved ability to conduct rapid response science in an oceanographic setting. Over the months since the Hercules incident, scientists have been analyzing air, water, sediment, and fish samples for evidence of environmental



Fig. 1. The Hercules platform in flames on 23 July 2013.

Bonny Schumaker

contamination. These data will ultimately describe and constrain the environmental impacts of this short-lived event on the local environment.

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—SAMANTHA B. JOYE, Department of Marine Sciences, University of Georgia, Athens; email: mjoye@uga.edu; JOSEPH P. MONTOYA, School of Biology, Georgia Institute of Technology, Atlanta; STEVEN A. MURAWSKI, College of Marine Science, University of South Florida, St. Petersburg; TAMAY M. ÖZGÖKMEN, Rosenstiel School of Marine and

Atmospheric Science, University of Miami, Miami, Fla.; TERRY L. WADE, Geochemical and Environmental Research Group, Texas A&M University, College Station; RAFFAELE MONTUORO, Department of Atmospheric Sciences, Texas A&M University, College Station; BRIAN J. ROBERTS, Louisiana Universities Marine Consortium, Chauvin, La.; DAVID J. HOLLANDER, College of Marine Science, University of South Florida, St. Petersburg; WADE H. JEFFREY, The Center for Environmental Diagnostics and Bioremediation, University of West Florida, Pensacola; and JEFFERY P. CHANTON, Department of Earth, Ocean, and Atmospheric Science, Florida State University, Tallahassee