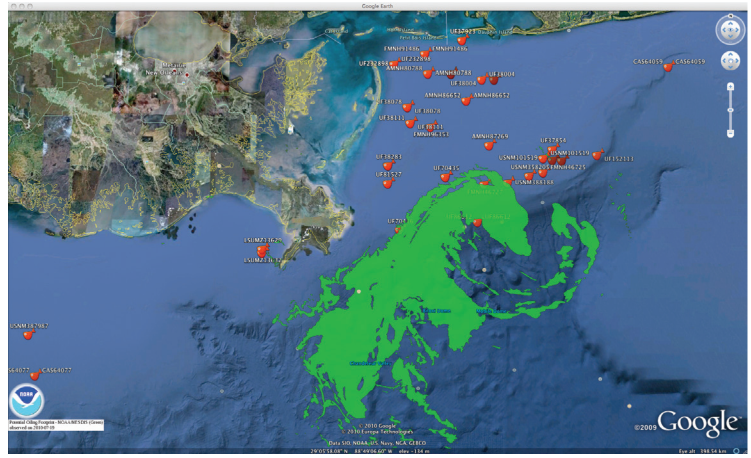
Tracking the impact of oil, chemicals on Gulf fish



When the Deepwater Horizon oil rig exploded off the Louisiana coast in April, it caused the first major deep-sea oil spill and became the first spill where chemical dispersants were used far below the water's surface. Researchers have detected toxic microdroplets spreading in concentrations that may be lethal to wildlife. Several organizations are tracking the toxins at the surface of the gulf and coastal environments, home to more than 600 species of commercially or evolutionarily important fish.

To complement these efforts, Dan Janies, Ph.D., a biomedical researcher at The Ohio State University (OSU), and Prosanta Chakrabarty, an assistant professor of ichthyology at Louisiana State University, have adapted a program to monitor infectious diseases that Janies developed with Ohio Supercomputer Center and OSU resources. Their mapping project, DepthMap, will tell scientists more about the impact of the spill on species at different stages of their life cycles and habitats.

"We combine data from historical collections of fish species with dynamic maps of the oil spill in a Geographic Information System," said Janies. "Put together, imagery on the spill and data on the pre-spill range of wildlife allow researchers a baseline from which to measure and predict the effects of the spill. We make the maps and underlying informatics tools available to a wide community of users via the web (depthmap.osu.edu), so others can leverage our work in clean-up efforts and research the impacts of the spill on any species of interest." ■

Project lead: Daniel Janies, The Ohio State University
Research title: Analysis of baseline distribution records for wildlife affected by the 2010 Gulf of Mexico oil spill
Funding source: The Ohio State University

Testing battery traits in hybrid vehicles

The power needs for extended all-electric operation of plug-in hybrid electric vehicles (PHEVs) require much more on-board energy than the lower-density energy typically provided by nickel-metal-hydride batteries. The current engineering solution is to link several parallel strings of lithium-ion battery cells within a battery module and to link several modules into larger battery packs.

But, these configurations had not been empirically tested to determine how changing temperature and energy loads on individual cells affect battery life. To accomplish this, Benjamin "BJ" Yurkovich, a graduate research fellow at The Ohio State University's Center for Automotive Research, first identified the model parameters of individual cells.

"Each cell in a battery pack is unique," said Yurkovich. "They vary in manufacturing variability, cell history and existing conditions, such as temperature, current and state-of-charge. These factors must be considered by a battery management system to achieve optimum voltage equalization."

Yurkovich then used the Ohio Supercomputer Center's Glenn Cluster and Remote MATLAB Services to develop and run a battery model based on the battery cell data and simulation algorithms.

"The simulations considered two different battery pack configurations, profiles for both hybrid and plug-in hybrid vehicles, three different temperatures, two different variations of internal resistance and capacity, three different states-of-charge and three different variations for the standard deviation," Yurkovich explained.

With his results, Yurkovich was able to provide a foundation for the design of more intelligent battery management system design in PHEV battery packs. ■

Project lead: Benjamin Yurkovich, The Ohio State University
Research title: Electrothermal battery pack modeling and simulation
Funding source: The Ohio State University