Gulf currents primed bacteria to degrade oil spill

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A new computer model of the Gulf of Mexico in the period after the oil spill provides insights into how underwater currents may have primed marine microorganisms to degrade the oil.

"It is called dynamic auto-inoculation. Parcels of water move over the ruptured well, picking up hydrocarbons. When these parcels come back around and cross back over the well, the bacteria have already been activated, are more abundant than before, and degrade hydrocarbons far more quickly," says David Valentine of the University of California, Santa Barbara, speaking today at the 111th General Meeting of the American Society for Microbiology.

Valentine has been studying microbial communities and the fate of chemicals 4000 feet below the surface from the Deepwater Horizon oil spill since June of 2010. Valentine and his colleagues at UC Santa Barbara, the University of Rijeka in Croatia, and the Naval Research Laboratory recently developed a computer simulation by coupling the Naval Research Laboratory's physical oceanographic model with their own discoveries and knowledge of the microbes responsible for breaking down the chemicals.

"We took the physical model of the deep Gulf of Mexico, added the hydrocarbons and bacteria, set reasonable guidelines for metabolism, and let them eat starting at day 1 of the spill," says Valentine.

To confirm that the model was providing them with an accurate picture

of what had happened they compared the model to spot measurements they and others had previously made in the Gulf.

"The model predicts the kinds of distributions observed at different times and locations. The assumptions that went into the model appear to be reasonable," says Valentine.

The most interesting observation they found using the model was dynamic auto-inoculation. Many parcels of water circulated in and out of the source area. Each iteration allowed the bacterial populations to increase in number and degrade the chemicals more rapidly.

"The more recirculation you have, the more quickly the hydrocarbons will be consumed," says Valentine. "We have developed a model that combines the large-scale movement of the water with the metabolism of the microbes. From that we are observing a phenomenon that molded the distribution of the bacteria over time and space, and that are consistent with real-world observations in the Gulf of Mexico."

Provided by American Society for Microbiology

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