New report calls for research to better understand, predict Gulf of Mexico's loop current system

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A new report from the National Academies of Sciences, Engineering, and Medicine calls for an international, multi-institutional comprehensive campaign of research, observation, and analysis activities that would help improve understanding and prediction of the Gulf of Mexico's Loop Current System (LCS). The position, strength, and structure of the LCS—the dominant ocean circulation feature in the Gulf—has major implications for oil and gas operations, hurricane intensity, coastal ecosystems, oil spill response, the fishing industry, tourism, and the region's economy.

The report identifies a suite of complementary research efforts that would provide critical information about the LCS to help promote safer offshore operations, better understand the Gulf's complex oceanographic systems, facilitate disaster response, help protect coastal communities, protect and manage ecological resources, and predict and forecast weather and climate impacts. Estimated to take about 10 years and cost between $100 million and $125 million, the recommended research campaign is critical for more accurate predictions of the Loop Current's path, the report says.

"Improving our predictive skills and understanding of the Loop Current System is critical to operational safety and a variety of human activities in the Gulf," said Paul G. Gaffney II, chair of the committee that wrote the report, a retired Navy vice admiral, and president emeritus of

Monmouth University. "Moreover, improving ocean modeling in the Gulf will also inform prediction efforts in other ocean basins. Our report identifies gaps in knowledge and recommends comprehensive measurements and research efforts that could be undertaken to fill these gaps."

The LCS flows northward through the Yucatán Channel up into the Gulf of Mexico where it eventually turns eastward and then southward before exiting out through the Florida Straits and feeding into the Gulf Stream. The position of the current varies greatly depending on whether it is in a retracted state or a more northerly, extended state. In addition, circular currents known as eddies—which can be 100-200 miles in diameter—occasionally separate from the main flow of the LCS and slowly migrate into the western Gulf.

Advancing understanding of the LCS could provide many benefits, the report says. For example, the lack of real-time, in situ observations in the deep ocean after the Deepwater Horizon oil spill made it difficult for first responders to track oil under the ocean's surface. Better information could have improved spill response and recovery operations. In addition, when the LCS is in its extended state, its strong currents pose significant operational safety concerns for oil and gas operations, causing costly slowdowns or shutdowns. Knowledge of the factors and dynamics that cause the LCS extended state could help the industry be better prepared.

However, despite decades of research, important questions about LCS dynamics remain unanswered, such as factors that influence the Loop Current extension into the Gulf and eddy shedding from the Loop Current. Most scientific observations of the LCS have been limited to ocean surface features and satellite data, and although there have been a number of field studies of the full water-column from ocean surface to seafloor, they were of limited geographic scope and over short time periods. While this research has advanced knowledge of the LCS,

significant gaps remain in understanding the formation, variability, and structure of the LCS and its interaction with other dynamic processes in the Gulf.

The research campaign identified in the report consists of 30 recommendations for both near-term and long-term (decadal length) activities, which are divided into observational components, technology enhancements, analyses and theory, and data assimilation and numerical modeling techniques needed to provide critical information about the LCS. The recommendations are intended to help guide future funding investments by the Gulf Research Program (GRP) of the National Academies of Sciences, Engineering, and Medicine, as well as federal U.S. agencies, Mexican and Cuban oceanographic research entities, research institutions, and other ocean science sponsors.

A webinar about the report and the first GRP funding opportunity related to it is scheduled for Thursday, Jan. 18 at 3 p.m. EST. The funding opportunity will open in early February and will focus on the report's near-term recommendations, which address activities that can be started before extensive planning for the larger research campaign has gotten underway. The observations and analyses to be completed through this initial funding opportunity will jumpstart and inform the design of the campaign. To receive updates, visit http://www.nas.edu/gulf/enews.

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