

Researchers track nutrient transport in the Gulf of Mexico

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Researchers from Florida State University are shedding light on nutrient

levels in the Gulf of Mexico with new findings published this month in the *Journal of Geophysical Research—Oceans*.

The Gulf of Mexico receives considerable levels of nutrients from the rivers that empty into it, especially the Mississippi River, which causes the Gulf's northern shelf waters to become overly enriched and more susceptible to algae growth. But scientists have remained unsure whether a significant portion of those nutrients ever leave the Gulf to potentially impact the chemistry of the North Atlantic Ocean.

"The Gulf of Mexico is an economically important body of water, as the surrounding areas rely on it for tourism, fisheries and oil production, and it also has significant ecological diversity," said Samantha Howe, a graduate student in the College of Arts and Sciences' Department of Earth, Ocean and Atmospheric Science, who led the research. "It is important to track the [nutrient](#) input from the Mississippi and Atchafalaya River System to the Gulf as those nutrients contribute to harmful algal blooms on the Northern Gulf Shelf."

Researchers found no evidence that nitrate from the Mississippi-Atchafalaya River System is mixing across the Northern Gulf shelf into the open waters of the Gulf of Mexico. The findings are consistent with recent modeling work by fellow scientists that indicates 90 percent of Mississippi River nutrients are retained in the near-shore ecosystem, which implies that nutrients from the Mississippi River do not leave the Gulf.

"In order to assess and manage ecological challenges in the Gulf, it is critical to understand whether the nutrients are processed and retained nearshore or whether they are transported to the North Atlantic," Howe said. "This finding is valuable to know, as these ecosystems must harbor the nutrient burden."

To conduct the study, the team collected and analyzed water samples taken during four different research cruises to the Gulf and the Florida Straits from 2011 to 2018.

The research is the first ever to provide isotopic composition measurements of nitrate in the Gulf of Mexico, as well as a new isotopic profile from the Florida Straits. These new water column profiles were then compared with prior measurements from the North and South Atlantic and with the magnitude of nitrogen inputs to the Gulf.

Howe, who earned her bachelor's degree in environmental science from FSU in Spring 2019, is now pursuing her master's in aquatic environmental science. She began the nutrient research as part of her honors undergraduate thesis while working in the research lab of study co-author, Associate Professor of Oceanography Angela Knapp.

"Samantha's thesis looked for distinct geochemical signatures of nitrate from the Mississippi River and whether this nitrate made it off the Northern Gulf of Mexico shelf into the deep waters of the Gulf that mix with the Loop Current and leave via the Florida Straits to enter the North Atlantic," Knapp said.

Howe's collaborators on the study include co-authors Knapp and Carlos Miranda, a 2017 graduate of the FSU Department of Chemistry and Biochemistry and the FSU Department of Biological Science, and colleagues from the University of Southern Mississippi and the University of New Hampshire.

"This work has important implications for understanding the fate of nutrients from the Mississippi Atchafalaya River System and how to manage human inputs to coastal ecosystems," Knapp said.

More information: Samantha Howe et al, The Dual Isotopic

Composition of Nitrate in the Gulf of Mexico and Florida Straits,
Journal of Geophysical Research: Oceans (2020). [DOI:
10.1029/2020JC016047](https://doi.org/10.1029/2020JC016047)

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