How will future sea-level rise linked to climate change affect coastal areas?

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Performing field work at Morris Lake, one of the smaller of the roughly two dozen coastal lakes in Northwest Florida's Walton County. Pictured (l to r) are Florida State University geology faculty members Lynn Dudley (soil scientist), Yang Wang (geochemist) and Joseph F.Donoghue, the study's lead investigator. They have collected auger samples on the lake margins and cores in the middle of the lake itself. Credit: Courtesy of Joseph F. Donoghue, Florida State University Department of Geological Sciences

The anticipated sea-level rise associated with climate change, including increased storminess, over the next 100 years and the impact on the nation's low-lying coastal infrastructure is the focus of a new, interdisciplinary study led by geologists at The Florida State University.

"Our hypothesis is that the historic storm record, which extends back only about 150 years, isn't a reliable indicator of true storm frequency, but the long-term geologic record is," said Joseph F. Donoghue, an associate professor of geology at Florida State University and the study's lead investigator. "This project is crucial because the rates of change in environmental parameters predicted for the near future are much greater than those of the past several millennia. For example, some of the worst-case sea-level rise scenarios predicted for the near future have not been experienced by the coastal system for more than 8,000 years."

Funding for the research comes from a three-year, $1.03 million grant from the Strategic Environmental Research and Development Program (SERDP), an environmental science and technology initiative headed by the U.S. Department of Defense and administered in partnership with the Department of Energy and the U.S. Environmental Protection Agency.

By 2012, the study is expected to produce methodologies and models that help coastal planners and managers in all low-lying coastal regions better understand, address and mitigate the near-future effects of sea-level rise -- an especially critical issue for the Sunshine State. The research team will perform its field work along the Gulf of Mexico coast in Northwest Florida, a region of the Florida Panhandle distinguished by rare coastal lakes, which harbor sediments that form an environmental record dating back thousands of years.

"We have decided to focus our field work on the Northwest Florida coast for several reasons besides its proximity to Florida State," Donoghue said. "In terms of major coastal infrastructure, the area has Eglin Air Force Base, one of the largest air bases in the U.S. In addition, the central Panhandle coast has natural features, including coastal lakes, that lend themselves particularly well to the kind of work we want to do."

That work will employ a variety of possible scenarios for both sea level change and increased "storminess" -- more storms and more intense storms. Using models of coastal systems that include elements such as barrier islands, wetlands, estuaries and coastal groundwater supplies, the researchers will combine the various sea level and storm scenarios in multiple ways to gauge the potential effects.

Florida State University geologist Steve Kish, a co-leader of the study, is responsible for gathering and interpreting the remote sensing data. To lay the groundwork, he has sought and found maps, photos and other records dating back about 150 years that show the evolution of the Northwest Florida coast. The documents reflect surprising rates of change for the coastline in the last two decades, including a retreat landward averaging about six to 10 feet per year.

Meanwhile, a fast start on the field work has yielded significant early findings.

"We have been collecting sediment cores from some of the coastal lakes in Walton County," Donoghue said. "These lakes are unique. They are relatively long-lived, possibly 4,000 to 6,000 years old. Their bottom sediments contain a long, continuous record of coastal environmental conditions, including the occurrence of major storms. The lakes are situated behind barrier dunes, breached only during large storms that carry in marine water and overwash sand. As a result, the lake floors have a chemical and sedimentologic 'signature.'"

The researchers are analyzing the lake sediment cores using radiocarbon dating, stable isotope analyses and standard sedimentologic measurements. They hope to obtain a long-term -- several thousand years -- geologic record of storm occurrence for the region.

"This long geologic record of storm frequency will be compared with the

150-year-old historic storm record," Donoghue said. "Using the geologic record to run our climate models would give us greater confidence in the model results, which we then would use to predict the near-future climate for the coastal region."

Source: Florida State University (news : web)