

Scientific 'buried treasure' may yield data about shorelines' future

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Deep beneath the ocean floor off the New Jersey coast lie secrets that could help scientists predict how climate change might affect one of the most popular shorelines in the country.

Gregory Mountain, with a name that befits his expertise, teaches Earth and planetary sciences and has spent a lot of time in recent years sailing those waters to uncover the answers.

"This is ... to understand better what the future is going to hold," said Mountain, a professor at Rutgers University in New Jersey. "The future that is within our grandchildren's time."

He and a team of scientists will set sail again in June, armed with the latest in three-dimensional imaging equipment, to capture cross-sectional pictures of the ocean floor. Like tree rings, the layers of underwater sediment provide a history of the Jersey shoreline.

Buried in the sand for thousands of year, the data might offer a glimpse of what rising sea levels caused by the heating of the ocean, as well as the warming on shore, could mean for the coastline.

Think of it this way, Mountain said: The route of the Garden State Parkway, which in many areas runs close to the coast, was underwater 125,000 years go. Over the next 100,000 years the shoreline extended out to sea, going so far as to expose the continental shelf. But in the last 20,000 years, merely a hiccup in geologic time, the Jersey shore returned

75 miles inland.

"That's a very fast retreat and a very fast advance," Mountain said. "The warming of the planet is now accelerating that change."

The work has triggered some controversy. The research ship will use air guns and a complex series of microphones to create images of the ocean floor. Mountain and a team of scientists from Rutgers and the University of Texas at Austin, with funding from the National Science Foundation, will immerse the air guns attached to long hoses off the back of the research ship.

Environmental groups have expressed concerns about the impact on sea life. The guns will shoot compressed air at specified intervals toward the ocean floor, creating sounds like a series of large balloons popping underwater, according to Arthur Lerner-Lam, the deputy director of Lamont-Doherty Earth Observatory, which owns the research vessel

The "balloon orchestra" generates echoes off the [ocean floor](#), Lerner-Lam said. A complex array of microphones will record the echoes and software on board will translate the sounds into three-dimensional images.

The two-dimensional images the scientists have already captured are "like a slice through cake, but you can't understand the layers of ancient landscapes" when only a slice is provided, according to Craig Fulthorpe, another principal investigator on the project. "We want to image these the way you would look at a modern map."

Fulthorpe, a senior research scientist in geophysics at the University of Texas, has been studying shorelines for more than 20 years. The three-dimensional images will help scientists determine whether there are river valleys or tidal channels in the different layers, features that don't show

up in two-dimensional images, he said.

By using the new images and samples of sediment collected from those layers in 2009, scientists can date them and create a timeline. The deepest of the layers recorded dates back almost 40 million years.

Fossils, such as plankton - about the size of a period on a printed page - are particularly helpful in the dating because of their prevalence in the layers, Mountain explained.

Clean Ocean Action, a waterways protection group, fears that the increased noise in the ocean will affect the behavioral patterns of endangered species. The National Marine Fisheries Service granted the group an extension to the public comment period about the plan until May 16.

While there will be marine biologists on board the research vessel to listen and watch for marine life and shut down operations if necessary, Clean Ocean Action fears they may not be able to detect the animals until it's too late.

"Marine mammals are not always vocalizing at all times," said Cassandra Ornell, a staff scientist for the group.

North Atlantic right whales, for instance, are an endangered species with a population of fewer than 500, Ornell said, and any impact on that population might have devastating consequences for the whales. The likelihood of North Atlantic right whales appearing in that area is low, according to an analysis done by LGL Limited, an environmental research firm, for the Lamont-Doherty Earth Observatory and the National Science Foundation.

The impact on marine life, according to the report, would be "short-

term, localized changes in behavior and distribution near the seismic vessel."

Other critics fear that the research is a cover for oil and gas exploration. But Mountain said the area was too close to shore to be of interest to oil companies and that past drilling for sediment samples had showed the area was "dry as can be." Clean Ocean Action wants the research plans to be analyzed more thoroughly before approval.

A final decision by the National Marine Fisheries Service will come after the comment period ends.

"New Jersey is the 'sea-level state,' " Fulthorpe said, commenting on how the state's coast is the perfect place for this type of research. "They should have it on their license plates."

He explained that while the research there is important, scientists would have to conduct the same research in other oceans to reach conclusions about global sea level changes. He's been involved in work off the coast of New Zealand.

"We're studying this for many scientific reasons," he said. "But fundamentally it helps us to understand the response of the shorelines to sea level change."

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