Scientists identify heat wave at bottom of ocean

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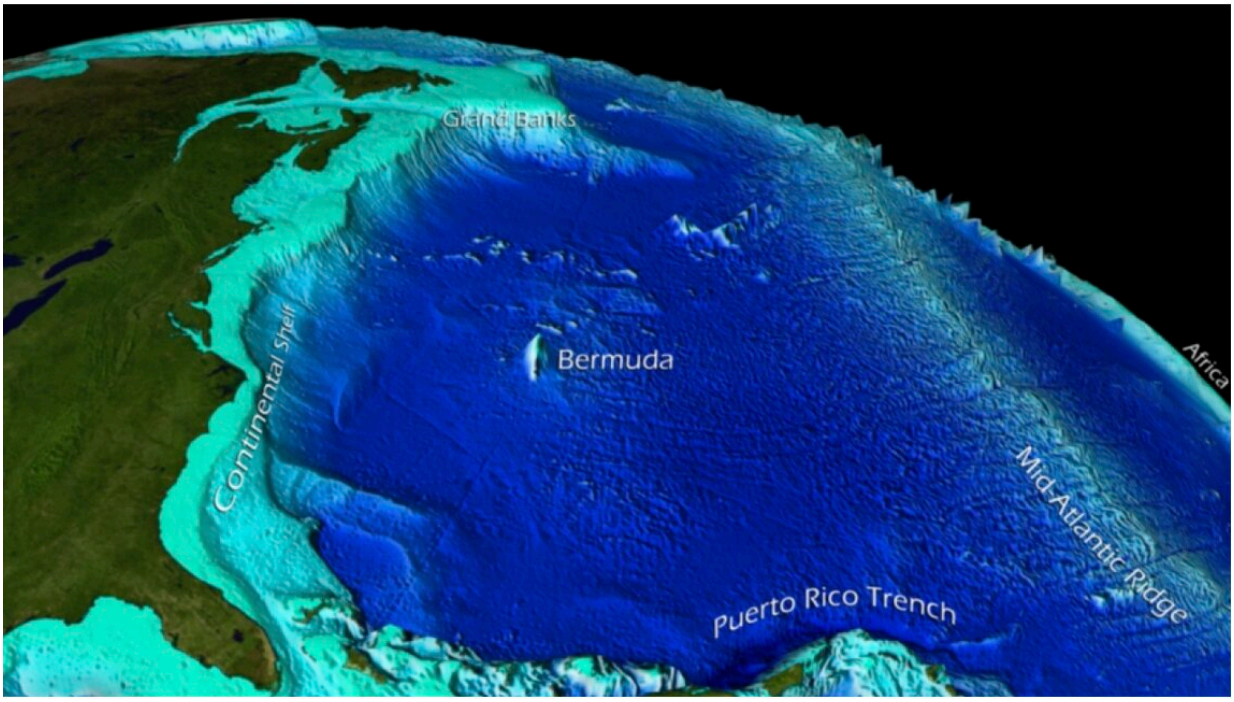


This visualization depicts bathymetric features of the western Atlantic Ocean Basin, including the continental shelf, captured by satellite. Credit: NOAA's National Environmental Satellite and Information Service

The 2013-2016 marine heat wave known as "The Blob" warmed a vast expanse of surface waters across the northeastern Pacific, disrupting West Coast marine ecosystems, depressing salmon returns, and damaging commercial fisheries. It also prompted a wave of research on

extreme warming of ocean surface waters.

But, as new NOAA research shows, marine heat waves also happen deep underwater.

In a paper published in the journal *Nature Communications*, a team led by NOAA researchers used a combination of observations and computer models to generate the first broad assessment of bottom marine heat waves in the productive continental shelf waters surrounding North America.

"Researchers have been investigating marine heat waves at the sea surface for over a decade now," said lead author Dillon Amaya, a research scientist with NOAA's Physical Science Laboratory. "This is the first time we've been able to really dive deeper and assess how these extreme events unfold along shallow seafloors."

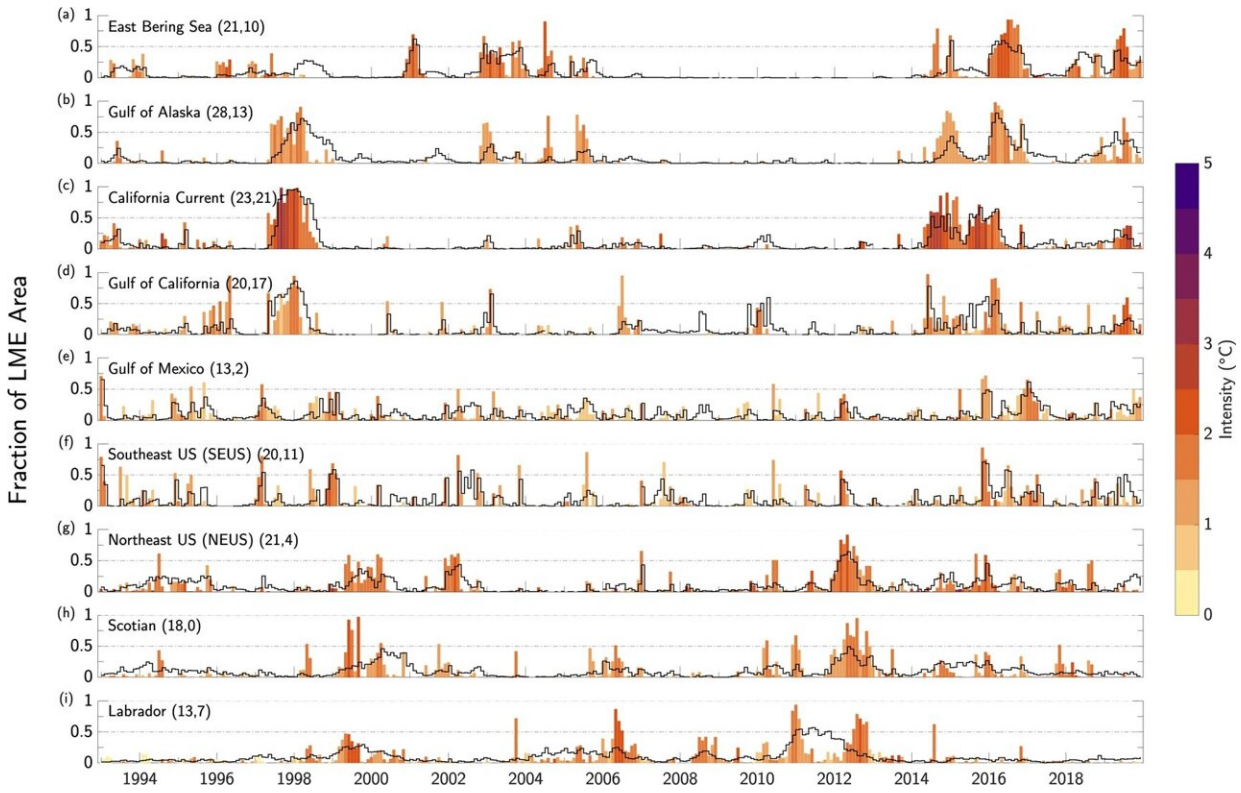
Marine heat waves dramatically impact the health of ocean ecosystems around the globe, disrupting the productivity and distribution of organisms as small as plankton and as large as whales. As a result, there has been a considerable effort to study, track and predict the timing, intensity, duration, and physical drivers of these events.

Most of that research has focused on temperature extremes at the ocean's surface, for which there are many more high-quality observations taken by satellites, ships, and buoys. Sea surface temperatures can also be indicators for many physical and biochemical ocean characteristics of sensitive marine ecosystems, making analyses more straightforward.

About 90% of the excess heat from global warming has been absorbed by the ocean, which has warmed by about 1.5C over the past century. Marine heatwaves have become about 50% more frequent over the past

decade.

In recent years, scientists have increased efforts to investigate marine heat waves throughout the water column using the limited data available. But previous research didn't target temperature extremes on the ocean bottom along continental shelves, which provide critical habitat for important commercial species like lobsters, scallops, crabs, flounder, cod and other groundfish.



Bottom vs. surface marine heatwave spatial extent. **a–i** The fraction of each Large Marine Ecosystem's (LME) area experiencing surface marine heatwave (SMHW) conditions for each month from 1993–2019. Shading denotes average SMHW intensity (°C) in a given month, as measured by sea surface temperature anomalies (SSTAs) averaged across all grid cells experiencing SMHW conditions. Black contours mark fraction of LME's area in bottom marine heatwave (BMHW) conditions (i.e., bar height in Fig. 5). Horizontal gray lines

mark areal extents of 0.5 and 1. Note only grid cells with bottom depths