Over 500 gas plumes found to be bubbling up in the ocean along the eastern US coast

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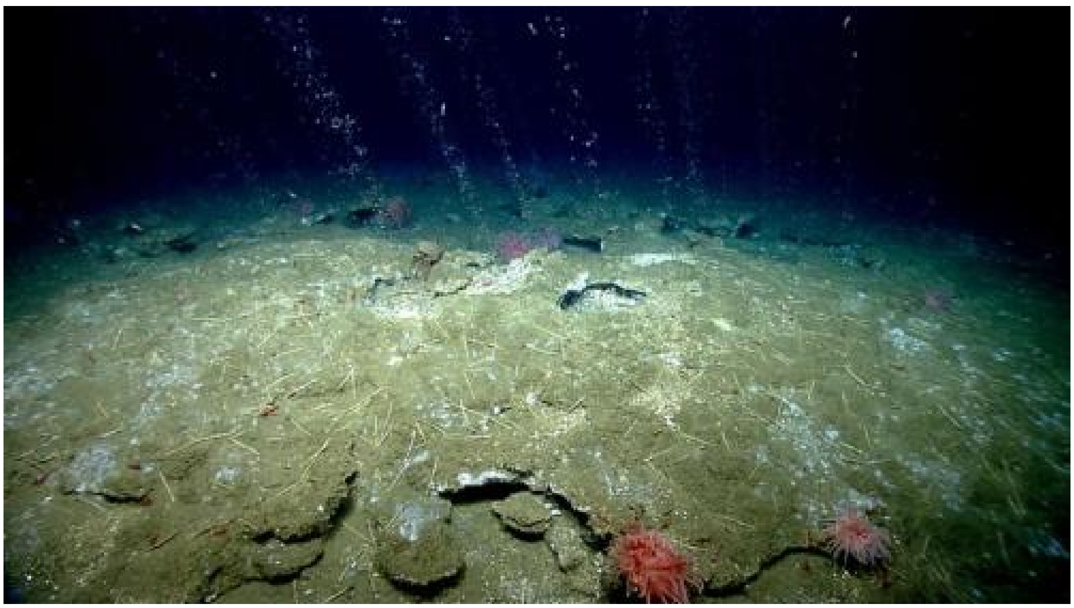

Methane streaming from the seafloor at ~425 meters (1400 ft) water depth offshore Virginia. Credit: NOAA Okeanos Explorer Program, 2013 Northeast U.S. Canyons Expedition.

(Phys.org) —A small team of researchers in the U.S. has discovered the presence of 570 bubble plumes along the Atlantic coast of the U.S. between North Carolina and Massachusetts—the plumes are believed to be methane seeps. In their paper published in the journal *Nature Geoscience*, the team describes their study of the seafloor and what the discovery of the plumes may mean for global warming.

The bubble plumes showed up on sonar scans conducted by the team over several outings during the period 2011 to 2013. Upon their discovery, the team took a closer look at several of the plume sources—some were surrounded by carbonate rock, which would have taken thousands of years to build up, indicting the plumes have been emitting gas for roughly the same length of time. Other plume sources, on the other hand, were not surrounded by such buildups and were located in more shallow areas, indicating they began emitting gas much more recently. It's this second type that is of concern. They researchers believe it's possible that a warmer ocean has caused crystallized hydrates to melt, releasing the methane they hold. That of course suggests that the bubbles themselves are filled with methane—a greenhouse gas.

Methane is known to have been trapped on the seafloor off the east coast of the U.S. after the most recent ice age due to lower sea levels exposing the sea floor. Scientists believe during that last ice age, the area was covered by wetlands, which of course are known to produce methane as plants die. As the ice melted, and seawater covered the area, the methane became trapped by crystallized hydrates because of the chilly temperatures. As the ocean warms, that process is reversed, allowing methane to escape, seeping out as bubbles in a plume. Most of those bubble don't make it to the surface of course, they dissolve into the seawater that surrounds them—but that process leads to more carbon dioxide in the water, making it more acidic, which can kill animal and plant life.

Methane seeping from near a mound covered with deep-sea mussels at ~1400 m (4600 ft) water depth just south of Norfolk Canyon, offshore Virginia. Credit: NOAA Okeanos Explorer Program, 2013 Northeast U.S. Canyons Expedition.

It's still not known for sure what exactly is in the bubbles, they've yet to be analyzed, but the researchers are almost certain it's mostly methane. If that is the case, and if it turns out many of the plumes are new, meaning they are the result of ocean warming, scientists might have to tinker with models and theories that attempt to describe the impact of global warming on both the sea, and the atmosphere.

More information: Widespread methane leakage from the sea floor on the northern US Atlantic margin, *Nature Geoscience* (2014) DOI: 10.1038/ngeo2232

Abstract
Methane emissions from the sea floor affect methane inputs into the atmosphere1, ocean acidification and de-oxygenation2, 3, the distribution of chemosynthetic communities and energy resources. Global methane flux from seabed cold seeps has only been estimated for continental shelves4, at 8 to 65 Tg CH_4 yr^{-1}, yet other parts of marine continental margins are also emitting methane. The US Atlantic margin has not been considered an area of widespread seepage, with only three methane seeps recognized seaward of the shelf break. However, massive upper-slope seepage related to gas hydrate degradation has been predicted for the southern part of this margin5, even though this process has previously only been recognized in the Arctic2, 6, 7. Here we use multibeam water-column backscatter data that cover 94,000 km^2 of sea floor to identify about 570 gas plumes at water depths between 50 and 1,700 m between Cape Hatteras and Georges Bank on the northern US Atlantic passive margin. About 440 seeps originate at water depths that bracket the updip limit for methane hydrate stability. Contemporary upper-slope seepage there may be triggered by ongoing warming of intermediate waters, but authigenic carbonates observed imply that emissions have continued for more than 1,000 years at some seeps. Extrapolating the upper-slope seep density on this margin to the global passive margin system, we suggest that tens of thousands of seeps could be discoverable.