Methane-munching microbes check climate

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Frozen methane bubbles escape from a gas seep of the Haakon Mosby Mud Volcano.

Credit: Ifremer

SYDNEY: Methane-eating microbes discovered on the ocean's floor may play a crucial role in the methane cycle and in keeping the global climate in check, a new study suggests.

A Franco-German team led by Antje Boetius of the Max Planck Institute for Marine Microbiology in Bremen, Germany, found three communities of single-celled organisms around the Haakon Mosby mud volcano in the Norwegian-Greenland Sea. Two of the organisms are species called archaeons - one of which was new to science - and the third is a bacterium which breaks down methane by using oxygen.

The mud volcano sits on the floor of the ocean, belching out methane gas along with a slurry of mud and sediment, according to the paper, which is published today in the British journal *Nature*. The surrounding colonies of the three microbes studied consumed about 40 per cent of the methane emitted, raising the question of what happened to the other 60 per cent.

"We have a big debate in the oceanogeographic and the biogeochemical community: are these deep-water methane seeps important in any way to our understanding of the methane cycle and also to climate change?" said Boetius. "When gas hydrate reservoirs are decomposing and emitting large amounts of methane, probably those large amounts of methane reach the atmosphere and then increase global warming."

Methane is the second most important greenhouse gas after carbon dioxide, responsible for a fifth of global warming over the past 200 years. It is emitted by both human activities and natural sources. Exploitation of fossil fuels and decaying landfill are the primary human sources, while rotting wetland vegetation is the major natural source.

While this study was the first to gather measurements of methane emissions from mud volcanoes, microbiologists are unsure of exactly how much methane is reaching the atmosphere.

"The main problem at the moment is that we have no clue of how many active mud volcanoes there are," said Boetius. "The reason that we don't know is because they don't have a very prominent height, [unlike] the magmatic volcanoes."

The Haakon Mosby spans a kilometre in diameter and rises only about 10 metres above the ocean floor. “To find it [the mud volcano] from a ship that is 3,000 metres above and use the physical tools to map the sea floor, this is only possible with the very high-resolution tools that have been available for maybe five years,” said Boetius.

These high-tech tools helped the research team identify the most effective methane-eaters: an animal-microbe team, Boetius said. The microbes live in seabeds along with tubeworms that pump sulphate - the key ingredient needed for the microbe to oxidise methane.

The next step for the research group is to determine whether the Haakon Mosby is an extreme example of a mud volcano, or if it represents the norm around the world. Yesterday, Boetius jetsetted to Crete, where she will be examining mud volcanoes in the eastern Mediterranean Sea before moving onto the Black Sea. Early next year, she plans to travel to New Zealand to look at more mud volcanoes.

Volume for volume, methane is 21 times more effective at trapping solar heat - the greenhouse effect - than carbon dioxide. Both gases have natural as well as man-made sources. While the Earth has undergone prolonged spells of warming and cooling due to volcanic eruptions and changes in the planet's orbit and axis, today's climate change is being blamed largely on the burning of fossil fuels.