The connections between methane cycling and nitrogen and phosphorus availability could have significant climatic implications[4]. Nitrogen and phosphorus play a key role in determining the growth of marine organisms at the bottom of the food chain, and the availability of these nutrients in the upper ocean is largely controlled by the upwelling of nutrient-rich waters from the deep ocean. Mixing between surface and deep-ocean layers is predicted to decrease as a result of greenhouse-gas induced global warming, making nutrient limitations more likely in surface waters. According to Karl and colleagues, this increased nutrient limitation could promote the use of phosphonates by marine microbes, and thus methane production, in a warmer world.

Whether methane production driven by phosphonate decomposition can fully account for methane supersaturation in the surface of the world's oceans depends on the supply of low-molecular-weight phosphonate compounds, such as methylphosphonates, to marine organisms that can use them. Recent oceanographic studies suggest that phosphonates are indeed found in the low-molecular-weight fraction of dissolved organic matter[10]. This finding nicely supports the idea presented by Karl and colleagues that simple compounds like methylphosphonate constitute a potential source of phosphonates for the methane production reaction.

The methane production mechanism proposed by Karl and colleagues could, in principle, operate over vast stretches of the global ocean. But only future research can determine the contribution of this mechanism, and the positive feedback it implies, to the evolution of global climatic change.

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CLIMATE SCIENCE

Of sun and ice

CLIFF A. LAVALLÉE

In September 2007, Arctic sea ice extent reached a new record low that undercut the previous minimum by 24%. The loss of northern ice was so substantial that it prompted Arctic researchers to speculate whether the ice cover had been tipped over the edge to deterioration. But the precise causes for the spectacular melting of 2007 are not clear.

One proposal, investigated by Axel Schweiger and colleagues (*Geophys. Res. Lett.* **35,** L10503; 2008), suggests that a persistent high-pressure system lingering over the Arctic region from June to August 2007 may have led to unusually low cloud cover that could have exacerbated normal summer melt and contributed to the record low. However, as is so often the case in climate studies, the story turns out to be more complex.

Satellites recorded sufficiently low cloud cover over the Arctic that summer to warrant the conditions to be considered unusual, but the blue skies did not coincide with the areas where the ice cover vanished. Instead, the summer sunshine spread across the northernmost Arctic Ocean, where sea ice was left intact even in 2007. Ice thicknesses decreased significantly in these northernmost regions in response to the sunny weather, although direct sunlight is not very effective at warming bright surfaces like sea ice — as anyone knows who has worn a black T-shirt and white trousers in the sun. But these ice losses did not count towards the record low because they were losses in thickness rather than ice-covered area.

The total contribution of clouds to the 2007 summer reduction in sea ice extent could be a different story. The Arctic ice ocean model used in Schweiger and colleagues' study simulates ice loss where it was observed — but as a consequence of cloudier skies. Although counterintuitive, this positive effect of cloud cover on ice melt can be explained through complex interactions between cloud cover, air temperature and humidity. However, the model does not fully include these interactions, leaving a full investigation of the contribution from clouds for future studies.

Clearly, blue skies are not to blame for the 2007 record low in sea ice extent. But the Arctic's sunny summer of 2007 could still contribute to the future prospects of the ice cover. The northernmost ice may have withstood the big melt of 2007, but thinner high-Arctic sea ice will be more vulnerable to further warming.

Heike Langenberg