

Higher temperature and hydrogen availability stimulated the methanogenic activity in east Antarctic subglacial sediment

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Subglacial ecosystem in Antarctica, though considered as cold and barren, is influential and, at the same time, sensitive to global climate. With liquid water, organic carbon and anoxia condition in subglacial sediment, microbial activity have been found here and methanogenesis is regarded as the last step of carbon metabolism. The powerful greenhouse gas, methane, is accumulative beneath the ice sheet and shows the potential effect on global climate change. However, the methane production in East Antarctica need more study.

In vitro incubation and molecular study were employed to study the methanogenesis in subglacial sediment in East Antarctica. The sediment was collected from the glacial margin and incubated at 1 °C, 4 °C, 12 °C with carbon source to test the methane production rate. The methanogens' marker gene, *mcrA* gene was analyzed to study the diversity and abundance of methanogens. Based on the *mcrA* gene analysis, hydrogenotrophic methanogens were dominant here which was consistent with the result that much higher methane production rate was observed with H₂ supplying. H₂ could be produced through the degradation of organic carbon which was affected positively by temperature. This finding highlights the chemical and physical condition effect on methanogenesis in subglacial sediment and supports the notion that greenhouse gas could be produced beneath ice sheet and may have positive feedback on global warming considering that the produced methane beneath ice sheet could be released into the air.