4.3.P02

Rates of bacteriogenic iron oxide development in a deep igneous rock aquifer

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The presence of microbial ecosystems in deep subsurface igneous rock groundwater has been well established, however, rates of microbial colonization and community succession has not. At the Äspö Hard Rock Laboratory (HRL) in Sweden, a Bacteriogenic Iron Oxide (BIOS) continuous flow apparatus (BRIC) has been developed and installed, providing an *in situ* system facilitating the investigation of microbial succession rates under aerobic and neutral pH conditions [1]. Sampling from the BRIC occurred at the onset of the experiment, after 3 weeks and 1 month. Gas composition of the BRIC water revealed a downstream decrease of CH_4 and an increase of CO_2. Quantities and rates of CH_4 consumption and CO_2 production were consistent with bacterial methane oxidation, and further evidence for this came from type I methane oxidizing bacteria (MOB) being detected by fluorescent *in situ* hybridization (FISH), polymerase chain reaction (PCR) *pmoA* amplified genes and most probable number (MPN) viable cell counts detecting 1100 cells/mL and 28 cells/mL of type I and II MOB respectively. Colonization of the BRIC occurs in less than 3 weeks as iron oxide precipitates were abundant and ATP biomass values did not increase after this amount of time.

References

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4.3.P03

Mineralization of organic matter in the sediments of Lake Baikal: A high resolution porewater study

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Introduction

Lake Baikal, the world largest lake by volume, has become a key site for paleoclimatic research in recent years since the 7 km thick sediment layer harbours the longest continuous climate record on the Eurasian continent. However, organic material is exposed to oxic conditions for years and highly degraded before burial. Therefore, the processes in the oxic sediments are crucial for the interpretation of the deeper sediment archive. With ion-selective electrodes for O_2, pH and CO_3^{2-} and a micromanipulator we investigated mineralization processes in sediment cores in the South Basin of Lake Baikal.

Results and Discussion

Oxygen penetrated the sediment by 15-27 mm and showed typically two zones of intense O_2 consumption (Fig. 1). We attribute the upper zone below the sediment surface to intense oxic respiration by heterotrophic bacteria. The zone at the lower end of the profile, however, may be the place of re-oxidation processes of reduced species from anaerobic processes in deeper sediments by chemotrophic bacteria.

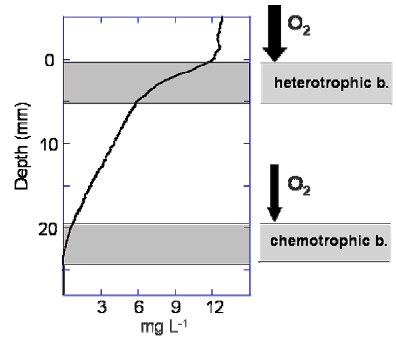

Fig. 1 Oxygen profile in the sediment core from 600 m depth showing two zones of intense O_2 consumption.

The characteristic shape of these profiles allows a separation of the oxic from anoxic mineralization. In the South Basin, the total mineralization ranged between 2.2 and 5.2 mmol C m^{-2} d^{-1}, where 60-77% was mineralized aerobically.

The excellent agreement of produced CO_2 either calculated from pH and CO_3^{2-} profiles or from O_2 profiles emphasised the dominance of oxic respiration as well as the absence of an efficient buffer system in these carbonate poor sediments.