

**MICROBIAL FORMATION OF DIMETHYL SULFIDE IN ANOXIC SEDIMENT OF LAKE PLUßSEE (GERMANY)**

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Dimethyl sulfide (DMS) is a key compound in the marine sulphur cycle. At the interface between seawater and atmosphere, DMS-derived sulphate aerosol particles may act to counterbalance the climate warming effect, whereas in the marine sediment DMS is known to be a non-competitive substrate for methanogens. The role of DMS in terrestrial environments and the biogeochemical processes involved were less explored. In anoxic freshwater sediments, DMS was shown to be either a metabolite from degradation of sulphur-containing organic compounds (e.g. Kiene and Hines, 1995) or the product of transmethylation from methoxylated aromatic compounds to hydrogen sulphide, probably via the intermediate of methanethiol (e.g., Bak et al., 1992). In both cases, the carbon in DMS originates from sedimentary organic matter.

In this study, the anoxic sediment slurries of Lake Plußsee was incubated at temperatures from 4°-55°C to examine the formation of methane, acetate and methylated sulphur gases. <sup>13</sup>C-labeled substrates were added to trace the carbon flow among different carbon pools. At elevated temperatures, we observed the formation of DMS. Production of DMS was biological since it was not observed in autoclaved sediment. Generation of DMS was stimulated by addition of H<sub>2</sub> (1 bar overpressure in headspace) and bicarbonate (final concentration, 10 mM). DMS concentrations increased linearly during two incubation experiments lasting nine and 12 days with rates of 84 and 201 nmol per liter of slurry per day, respectively (Fig. 1a, nine-day experiment). When we increased bicarbonate concentration from 10 to 100 mM, however, the DMS production did not increase correspondingly. Determined by gas chromatography-isotope ratio monitoring-mass spectrometry, carbon isotopic values of DMS from unspiked samples are around -65‰.  $\delta^{13}\text{C}$  values of DMS increased progressively after the addition of H<sup>13</sup>CO<sub>3</sub><sup>-</sup> (Fig. 1b). In contrast, the addition of [2-<sup>13</sup>C]-acetate (final acetate concentration, 10 mM) and H<sub>2</sub> did not result in a significant <sup>13</sup>C-enrichment of DMS. The present data are consistent with methyl group(s) of DMS being derived from reduction of bicarbonate. Our observation is the first to show the incorporation of inorganic carbon into DMS.

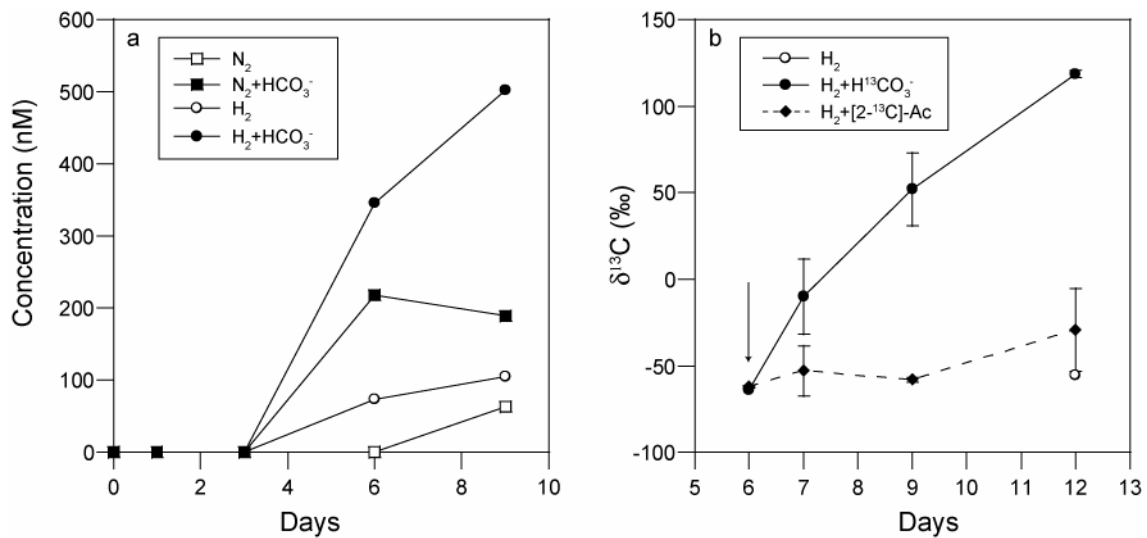


Figure 1. Formation of dimethyl sulfide and its  $\delta^{13}\text{C}$  signals in the anoxic Plußsee sediment incubated at  $55^\circ\text{C}$ . Data in (a) and (b) are from separate experiments. The concentration data in (a) are from a single-bottle experiment but the pattern is reproducible in similar incubations. The time of label addition is indicated by the arrows. A lack of visible error bars in (b) indicates that the range of error from two replicates falls within the symbol.

## REFERENCES

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