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Biomethylation Processes Contributing to Geochemical Cycling of Metal(loid)s

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Biomethylation is a global process transferring metal(loid)s into methylated species by microbial activity. The compounds generated are volatile permethylated compounds, and partly methylated species soluble in water as well as in lipids of organisms, eventually leading to accumulation within the aquatic food chain. More than 30 compounds of 10 elements have been detected by our group in environmental gases and waters, soils and sediments in concentrations of several ng to some µg per m^3L/kg (Feldmann & Hirner, 1995; Hirner et al., 1994, 1998a, 1998b; Krupp et al., 1996).

Since these investigations require hyphenated analytical techniques (LTGC/ICP-MS) just available since approx. ten years, contributions of bio-methylation to the global cycling of metal(loid)s have not been taken into account. A preliminary estimation of the amount of metal(loid)s volatilised by biological methylation can be based on the known global rates of methanogenesis and rough assumptions concerning the chemical composition of the evolved gases. Consequently, at present the uncertainty range of resulting concentrations is several orders of magnitude.

To improve this unsatisfactory situation,

(i) detailed analyses of the main global emission sources (e.g. wetlands, cattle), and (ii) investigation of unusual sources for metal(loid)organic emissions into the air like degassing from water bodies (Hirner et al., 1998a) or from soils surrounding ore bodies (Hirner et al., 1998b) are necessary, and will be subject to further research.

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