



Implications of temperature and sediment characteristics on methane formation and oxidation in lake sediments

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Methane emissions from aquatic environments depend on methane formation (MF) and methane oxidation (MO) rates. One important question is to what extent increased temperatures will affect the balance between MF and MO. We measured potential MF and MO rates simultaneously at 4°C, 10°C, 20°C and 30°C in sediment from eight different lakes representing typical boreal and northern temperate lake types. Potential MF rates ranged between 0.002 and 3.99 $\mu\text{mol CH}_4 \text{ g}_{d.w.}^{-1} \text{ day}^{-1}$, potential MO rates ranged from 0.01 – 0.39 $\text{CH}_4 \text{ g}_{d.w.}^{-1} \text{ day}^{-1}$. The potential MF rates were sensitive to temperature and increased 10 to 100 fold over the temperature interval studied. MF also differed between lakes and was correlated to sediment water content, percent of organic material and C:N ratio. Potential MO did not depend on temperature or sediment characteristics but was instead well explained by MF rates at the *in situ* temperature. It implies that elevated temperatures will enhance MF rates which may cause increased methane release from sediments until MO increases as well, as a response to higher methane levels.