

Methane emissions from lakes: Dependence of lake characteristics, two regional assessments, and a global estimate

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[1] Lake sediments are “hot spots” of methane production in the landscape. However, regional and global lake methane emissions, contributing to the greenhouse effect, are poorly known. We developed predictions of methane emissions from easily measured lake characteristics based on measurements for 11 North American and 13 Swedish lakes, and literature values from 49 lakes. Results suggest that open water methane emission can be predicted from variables such as lake area, water depth, concentrations of total phosphorus, dissolved organic carbon, and methane, and the anoxic lake volume fraction. Using these relations, we provide regional estimates from lakes in Sweden and the upper midwest of the United States. Considering both open water and plant-mediated fluxes, we estimate global emissions as 8–48 Tg CH₄ yr⁻¹ (6–16% of total natural methane emissions and greater than oceanic emission), indicating that lakes should be included as a significant source in global methane budgets. *INDEX TERMS*: 4805 Oceanography: Biological and Chemical: Biogeochemical cycles (1615); 4806 Oceanography: Biological and Chemical: Carbon cycling; 4810 Oceanography: Biological and Chemical: Corrosion; 4845 Oceanography: Biological and Chemical: Nutrients and nutrient cycling; *KEYWORDS*: methane emission, lakes, greenhouse gases, ebullition, regional, global

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