北東シベリアタイガ - ツンドラ境界域湿地土壌のメタン酸化ポテンシャル

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Methane Oxidation Potential of Arctic Wetland Soil of a Taiga-Tundra Ecotone in Northeastern Siberia

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Arctic wetlands are significant sources of atmospheric methane and the observed accelerated warming of the arctic will cause increased methane formation in water-saturated tundra soil with deepened permafrost thawing. Methane oxidation is regarded as the key process to regulate methane emission from wetlands. In this study we determined the potential methane oxidation rate of the wetland soils of a Taiga-Tundra transition zone at Kodak station near Chokurdakh in Northeastern Siberia with special reference of the spatial heterogeneity and response to environmental parameters. The surface soil samples (0-10 cm) were collected from depressions that were covered with tussocks of sedges and *Sphagnum* spp. and mounds that were vegetated with the other kinds of moss and larch trees in the summer of 2012 and 2013. The potential methane oxidation rate was estimated by a bottle incubation experiment in which homogenized soil samples were incubated with methane at the initial concentration of 0.5-0.8 %(v/v). Soil samples from the mound showed no detectable methane oxidation, while soils collected from depressions exhibited active methane oxidation with no lag. The methane oxidation rates at 15 ºC were 270 and 190 nmol h^{-1} g^{-1} dw in the moss- and sedge-dominated zones, respectively. Temperature-dependent methane oxidation was observed at the range of temperature from 0 to 15 ºC. The estimated threshold temperature of methane oxidation suggested that methane may be oxidized at subzero temperatures. Methane oxidation was active over the depths including the water-saturated anoxic layers, which showed the resilience of methane oxidizing bacteria. The maximum methane oxidation rate was recorded in the layer above the water-saturated layer: the surface (0-2cm) layer in the sedge-dominated zone and in the middle (4-6 cm) layer in the moss-dominated zone. Treatment with inorganic nutrients and black carbon did not affect the potential methane oxidation rate.

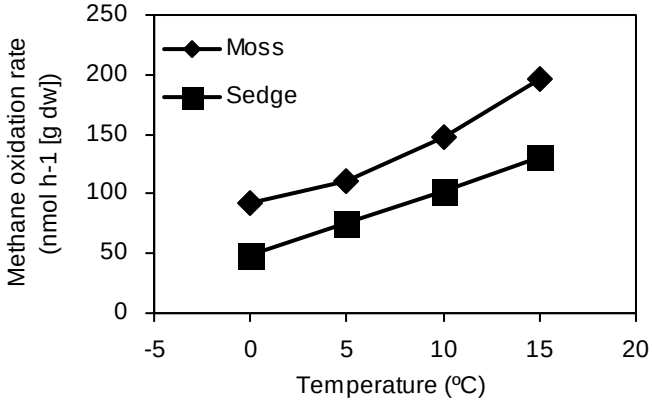

Fig. 1. Effect of temperature on the potential methane oxidation rate of wetland soils.