

Mineralization Rate of Soil Organic Carbon at the Lowland of Indigirka River in North-eastern Siberia

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The Arctic has a large amount of organic carbon accumulated in the soil. If the enhanced warming under the Arctic amplification leads to higher soil temperature or deepening of the active layer, emission of greenhouse gases, i.e. CO₂ and CH₄ can increase. The decomposition rate of organic matter, which is an important factor of CO₂ and CH₄ emission, depends not only on the quantity of organic matter, but also on that quality. In this work, surface soils from the lowland of Indigirka river in Northeastern Siberia were incubated at constant temperatures (5, 10 °C) to evaluate the production rates of CH₄ and CO₂ and to know the degradability of the soil organic matter.

The study site is around Chokurdakh (70.62 N, 147.90 E) located in the continuous permafrost of Eastern Siberia and situated in the boundary of tundra and taiga. Surface soil layers (ca. 10-60 cm deep) were sampled at 7 points of a drier mound with larch trees and of wetter areas with sedges and *Sphagnum spp.*. Besides thawed layers (10, 20, 30 cm deep) sampled in July were incubated at Chokurdakh for 8 days anaerobically, frozen soil layers sampled in the early summer of June (13-62 cm) were incubated in Japan for 34-42 days both anaerobically and aerobically. These soils include the active layer (ca. 20-50 cm) and the top of the permafrost of this region.

CH₄ production was not detected in the mound soils while CO₂ production was, suggesting areas with dry condition have few methanogens and will not produce CH₄ even if they turn into anaerobic condition. On the other hand, soils from wet areas produced CH₄ (0-0.88 μmol (g dry soil)⁻¹ day⁻¹) and the production as well as that of CO₂ was more active at the shallower layers, representing larger amount of labile organic matter. The rate of CH₄ production at 10 °C were found to be 0.9-1.1 times of that at 5 °C in the shallower layers (ca. 10-40 cm), while 1.9-3.3 times in the deeper layers (32-45 cm). It indicates that the temperature dependency of CH₄ production is higher in the middle to the bottom of the active layer than in the top layer.

Keywords: methane, carbon dioxide, incubation experiment, Eastern Siberia, taiga-tundra boundary, stable isotope ratio