学 位 論 文 内 容 の 要 旨

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学 位 論 文 題 名

Studies on vegetation mapping and methane emissions in a taiga-tundra boundary lowland, northeastern Siberia
（北東シベリアタイガ-ツンドラ境界における植生マッピングとメタン放出に関する研究）

The taiga–tundra boundary ecosystem is expected to be affected by climate change. While high latitude regions could contribute substantially to methane (CH_4) emissions, those emissions in the taiga–tundra boundary has been only sparsely evaluated at local to regional scales. Here, we linked *in situ* CH_4 fluxes from 2009 to 2016 with vegetation cover, and scaled these findings to estimate CH_4 emissions at a local scale (10 × 10 km) using high-resolution (0.5 m) satellite images in a taiga–tundra boundary ecosystem on permafrost (Indigirka lowland, northeastern Siberia). We also linked samples of dissolved methane concentrations in the river water in 2016 (usual year) and 2017 (extreme flooding) with satellite water colour for delineating different water sources. *In situ* CH_4 emissions were high in the wetland vegetation classes, including cotton-sedge, *Sphagnum*, and emergent plants. Lakes and rivers were also CH_4 sources, while forest floors were not a CH_4 sink. Furthermore, relatively high concentrations of dissolved methane (0.7–1.1 μmol l^{-1}, or μM) were observed in four tributary areas in 2017 during the flood's recession, while these values remained low in the main channel (0.2–0.3 μM). Estimated local CH_4 emissions (36 mg m^{-2} d^{-1}) were higher than those of other tundra studies in eastern Siberia. Our results indicate that: i) sedge and emergent wetland ecosystems in the taiga–tundra boundary lowland act as hot spots for CH_4 emissions, ii) tree distribution does not regulate the local CH_4 emissions and balances, because of sparse tree coverage, and iii) we demonstrated that an approach to estimating dissolved methane concentrations using satellite reflectance which can provide a new tool for environmental monitoring of flood events in remote areas.